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The General Field of Psychology

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VOLUME 67

1967

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Published Bimonthly at 35 New St., Worcester, Mass.
Send all mail to Managing Editor, 2 Commercial Street, Provincetown, Massachusetts

AUTHOR INDEX

Alexander, Theron 141
Al-Issa, Ihsan 323
Anderson, Harry E., Jr. 221
Baer, Daniel J. 75
Bloomberg, Morton 127
Butler, Joel R. 211
Cameron, Jean 169
Cameron, Jean S. 257, 263
Capehart, Jack 287
Clark, Edward T. 249
Cook, Charlotte 221
Coyle, F. A. 65
Cutter, Henry S. G. 25
D'Angelo, Rita Y. 59
Darcy, John M. 299
Dominick, Joan R. 341
Dworkin, Samuel F. 47
Eakin, Dale 245
Eisenman, Russell 331
Field, Peter B. 47
Fowler, Raymond D., Jr. 65
Gellert, Elizabeth 107
Gibson, David A. 205
Ginsberg, Norman 161
Goodrich, Ann H. 313
Goodrick, Charles L. 191
Green, Dorothy D. 99
Greenblatt, Daniel L. 341
Heilizer, Fred 25
Hekmat, Hamid 17
Hergenhahn, B. R. 287
Hobson, Sally 147
Ihalainen, V. J. 3
James, W. T. 85
Jordan, Brian T. 211
Karlins, Marvin 335
Kern, Frank E. 221
Kingston, Albert J. 227
Kirk, William E. 241
Kraft, Tom 323
Lattal, Alice D. 319
Lattal, K. A. 319
Leaverton, Paul 141
Lepley, William M. 83
Levy, Harriet C. 303
Muro, James J. 235
Myers, Charles 287
Ohnmacht, Fred W. 235
Otis, Gerald 287
Pearlman, Joel 341
Perry, Oliver B. 271
Phelan, Jos. G. 17
Phelan, Joseph G. 299, 303
Platt, Jerome J. 85
Rentz, R. Robert 277
Robinson, Nancy 331
Salzinger, Kurt 147
Salzinger, Suzanne 147
Schwitzgebel, Ralph K. 75
Singh, Devendra 185
Specht, Priscilla G. 169, 257, 263
Spruill, Jean 245
Stabler, John R. 245, 271, 293, 313
Stoegbauer, Mary Kay 91
Stotsky, Bernard A. 341
Tang, Terry 17
Teel, Sidney K. 65
Thorpe, Jack W. 303
Tolor, Alexander 69
Walsh, John F. 59
Waters, L. K. 241
Weaver, Wendell W. 227
Wendt, G. R. 169, 201, 257, 263
White, William F. 227, 277
Wolfe, J. W. 201
Zimnavoda, Helen 299

TABLE OF CONTENTS

Learning and the association values of nonsense syllables 3
By V. J. Ihalainen

Some effects of various schedules of verbal reinforcement on self-reference responses 17
By Jos. G. Phelan, Terry Tang, and Hamid Hekmat

Cognition and risk taking in a classroom setting: Two methodologies . . 25
By Fred Heilizer and Henry S. G. Cutter

Strategies of hypnotic interrogation 47
By Peter B. Field and Samuel F. Dworkin

An evaluation of various therapy approaches with lower socioeconomic-group children 59
By Rita Y. D'Angelo and John F. Walsh

The measurement of alcoholic response to treatment by Barron's Ego-Strength Scale 65
By Raymond D. Fowler, Jr., Sidney K. Teel, and F. A. Coyle, Jr.

An evaluation of the Maryland Parent Attitude Survey 69
By Alexander Tolor

Intensive supervision by parole officers as a factor in recidivism reduction of male delinquents 75
By Ralph K. Schwitzgebel and Daniel J. Baer

The synonym vocabulary tests: Forms I and III compared 83
By William M. Lepley

Response to stimulus change in the opossum 85
By Jerome J. Platt and W. T. James

The relationship of psychometrically determined personality variables to perception of the Ames Trapezoidal Illusion. I 91
By Mary Kay Stoegbauer

The relationship of psychometrically determined personality variables to perception of the Ames Trapezoidal Illusion. II 99
By Dorothy D. Green

Children's lateralization of human figures: Analysis of a developmental transition 107
By Elizabeth Gellert

An inquiry into the relationship between field independence-dependence and creativity 127
By Morton Bloomberg

Differentiation between normal and disordered children by a computer analysis of emotional and verbal behavior 141
By Theron Alexander and Paul Leaverton

The effect of syntactical structure on immediate memory for word sequences in middle- and lower-class children 147
By Suzanne Salzinger, Kurt Salzinger, and Sally Hobson

Ascending-descending differences in *CFF* measurement as a function of eccentricity and starting point 161
By Norman Ginsberg

Effects of two meprobamate-amphetamine combinations on moods, emotions, and motivations 169
By Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt

A note on spontaneous instrumental responding as a function of differential levels of drive and effort 185
By Devendra Singh

Learning and retention of a light contingent bar press response for three inbred strains of mice 191
By Charles L. Goodrick

Simultaneous electrical recording of independent and summated eye movements 201
By J. W. Wolfe and G. R. Wendt

Free-operant avoidance of stimuli associated with high fixed-ratio reinforcement 205
By David A. Gibson

GSR as a measure of the sexual component in hysteria 211
By Brian T. Jordan and Joel R. Butler

Correlational and normative data for the progressive matrices with retarded populations 221
By Harry E. Anderson, Jr., Frank E. Kern, and Charlotte Cook

Affective dimensions in connotative meaning in reading 227
By William F. White, Albert J. Kingston, and Wendell W. Weaver

Self-acceptance: Some anxiety and cognitive style relationships 235
By Fred W. Ohnmacht and James J. Muro

Birth order and PPS affiliation 241
By L. K. Waters and William E. Kirk

Preferences on the perceptual reaction test as a function of sex, school grade, and race 245
By John R. Stabler, Jean Spruill, and Dale Eakin

Sex differences in the perception of academic achievement among elementary school children 249
By Edward T. Clark

Effects of placebo and an acetaminophen-salicylamide combination on moods, emotions, and motivations 257
By Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt

Effects of dramamine-analgesic-caffeine combination on moods, emotions, and motivations 263
By Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt

Learning and retention as a function of instructional method and race . . 271
By John R. Stabler and Oliver B. Perry

Congruence of the dimensions of self-as-object and self-as-process . . . 277
By R. Robert Rentz and William F. White

Sampling of redundant cues in a successive discrimination problem . . . 287
By B. R. Hergenhahn, Gerald Otis, Jack Capehart, and Charles Myers

Probability learning in children as a function of age, magnitude of incentive, and percentage of reinforcement 293
By John R. Stabler

Replication of an investigation of concepts expressed by the term "true" as stated by experimental and clinical psychology students 299
By Helen Zimnavoda, Joseph G. Phelan, and John M. Darcy

Concept learning in schizophrenics and normals: Selection and addition of cues; effect of amount and type of memory information 303
By Joseph G. Phelan, Harriet C. Levy, and Jack W. Thorpe

Personality and family background correlates of students' response to physical danger 313
By John R. Stabler and Ann H. Goodrich

Student "gullibility": A systematic replication 319
By K. A. Lattal and Alice D. Lattal

Desensitization and reduction in cigarette consumption 323
By Tom Kraft and Ihsan Al-Issa

Complexity-simplicity, creativity, intelligence, and other correlates . . . 331
By Russell Eisenman and Nancy Robinson

A note on a new test of creativity 335
By Marvin Karlins

Medicare: A disaster for the aged psychiatric patient? 341
By Bernard A. Stotsky, Joan R. Dominick, Joel Pearlman, and Daniel L. Greenblatt

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Founded by G. Stanley Hall in 1891; reorganized by Carl Murchison in 1925

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VOLUME 4—July-December, 1928

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4 & 5. Methods for diagnosis and treatment of cases of reading disability—M. Monroe
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VOLUME 6—July-December, 1929

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Genetic Psychology Monographs *(continued)*

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Genetic Psychology Monographs *(continued)*

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VOLUME 65—January-June, 1962

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VOLUME 67—January-June, 1963

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VOLUME 68—July-December, 1963

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BIMONTHLY
Three volumes per year
Immediate publication

September, 1967
Volume 67, First Half

(Founded in 1935 by Carl Murchison)

The Journal of PSYCHOLOGY

The General Field of Psychology

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SEPTEMBER, 1967

(Manuscripts are printed in the order of final acceptance)

Learning and the association values of nonsense syllables 3
By V. J. Ihalainen

Some effects of various schedules of verbal reinforcement on self-reference responses 17
By Jos. G. Phelan, Terry Tang, and Hamid Hekmat

Cognition and risk taking in a classroom setting: Two methodologies . . 25
By Fred Heilizer and Henry S. G. Cutter

Strategies of hypnotic interrogation 47
By Peter B. Field and Samuel F. Dworkin

An evaluation of various therapy approaches with lower socioeconomic-group children 59
By Rita Y. D'Angelo and John F. Walsh

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Published at 35 New St., Worcester, Mass.
Second-class postage paid at Worcester, Mass.
Send all mail to Managing Editor, 2 Commercial Street, Provincetown, Massachusetts

The measurement of alcoholic response to treatment by Barron's Ego-Strength Scale 65
By Raymond D. Fowler, Jr., Sidney K. Teel, and F. A. Coyle, Jr.

An evaluation of the Maryland Parent Attitude Survey 69
By Alexander Tolor

Intensive supervision by parole officers as a factor in recidivism reduction of male delinquents 75
By Ralph K. Schwitzgebel and Daniel J. Baer

The synonym vocabulary tests: Forms I and III compared 83
By William M. Lepley

Response to stimulus change in the opossum 85
By Jerome J. Platt and W. T. James

The relationship of psychometrically determined personality variables to perception of the Ames Trapezoidal Illusion. I 91
By Mary Kay Stoegbauer

The relationship of psychometrically determined personality variables to perception of the Ames Trapezoidal Illusion. II 99
By Dorothy D. Green

Children's lateralization of human figures: Analysis of a developmental transition 107
By Elizabeth Gellert

An inquiry into the relationship between field independence-dependence and creativity 127
By Morton Bloomberg

Differentiation between normal and disordered children by a computer analysis of emotional and verbal behavior 141
By Theron Alexander and Paul Leaverton

The effect of syntactical structure on immediate memory for word sequences in middle- and lower-class children 147
By Suzanne Salzinger, Kurt Salzinger, and Sally Hobson

Ascending-descending differences in *CFF* measurement as a function of eccentricity and starting point 161
By Norman Ginsberg

Effects of two meprobamate-amphetamine combinations on moods, emotions, and motivations 169
By Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt

Published as a separate and in *The Journal of Psychology*, 1967, **67**, 3-15.

LEARNING AND THE ASSOCIATION VALUES OF NONSENSE SYLLABLES*

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A. INTRODUCTION

When studies have been conducted in determining the association values of what we call "nonsense syllables," subjects have been asked to say, for example, whether a syllable given them as stimulus makes them think of anything in particular (13), rouses a definite idea (15), or what it means to them, if anything (7). A syllable that has aroused association in only relatively few subjects has been given a low association value and *vice versa.*

Each of the three researchers mentioned above has published a list of nonsense syllables and the association values gained for them. Also Melton has drawn up a corresponding list which has, however, not been published but which has been used in researches [e.g. (3, 24)]. Most recently Archer (2) has published a list of the association values of syllables.

When compilations of syllable series have been made according to association value, it has been assumed that syllables with a high association value are easier to memorize than syllables with a low association value. Researchers have also started from the unspoken assumption that if syllables with the same association value are chosen from a list drawn up for the purpose, then the series thus achieved will be homogeneous as regards the degree of both learning and remembering difficulties, so that the various parts of the series can be mutually compared when studies are being made of such things as the effect of serial position [e.g. (5, 6, 11)]. Syllables with different association values have also been used to represent the various degrees of meaningfulness of the material to be learned [e.g. (1, 10)].

As regards the assumption on memorizing first mentioned above, Young (25) has shown experimentally that learning lists of syllables with a 20 per cent association value requires, roughly speaking, twice the number of attempts by the *S*s than learning lists with a 90 per cent association value. The impression we gain from this is supported by the research results of

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* Received in the Editorial Office, Provincetown, Massachusetts, on May 22, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

Goulet (9) and Davis (4). With Hull (12), on the other hand, the number of repetitions needed to learn 13-33 per cent association value syllables was only 3 per cent smaller than for zero-13 per cent syllables. Sarason (21), for his part, gave the *S*s lists compiled of 27, 53, and 80 per cent association value syllables to learn by the anticipation method. The results showed that the association values are not linearly related to learning. The difference in the number of right answers for the 27 and 53 per cent lists was not significant, nor were the differences between the different subgroups logical. The 80 per cent groups, however, showed very superior learning result. Mandler and Huttenlocher (17) proceeded by dividing the whole range of syllable association values at eight equal intervals and selected one pair of syllables (stimulus 4-reaction) for each interval. Thus a pair-association list of eight pairs was formed which had an associative frequency value that rose from minimum to maximum. Two such lists were drawn up. The results showed that, roughly speaking, as the association frequency values of syllables rise, less attempts at learning are needed, but the results were however not logical; and the variation both between the lists and within the lists was rather great. Whereas, for example, in list A the associative frequency values of syllable pairs rose fairly evenly from pair to pair, the average number of points for learning were in the following order: 21.00, 17.60, 20.20, 16.15, 11.70, 10.25, 16.35, 7.20. The corresponding figures for list B were 16.15, 12.20, 17.20, 9.45, 13.65, 12.35, 13.20, and 7.60. The product-moment correlation for list A was found to be .82 and for list B .62.

Underwood and Schultz (23) have also given attention to this problem. They used as material 22 trigrams, some of which were meaningful words, some ordinary nonsense syllables, and some units made up of consonants. Association pairs were made up of these in such a way that a one-figure number provided the stimulus and the trigram the answer. The results of the experiment showed that when the product-moment correlation between association values and learning was calculated, the result was rather high: i.e., .80.

Separate studies have also been made of learning syllables with different association values and, on the other hand, of retaining them in the memory. When Underwood and Richardson (22) compared the learning and remembering of 93.3-100 per cent and zero-20 per cent association value nonsense syllables, they found that the lists of syllables with a low association value required about 34-39 per cent more attempts to learn them than those with a high association value, but that there was no significant difference in the results of a recall test. Postman (20), too, shows that the meaningfulness of words favors learning, but not remembering [*cf.* Gorman (8)].

When investigators need fairly homogeneous test material in research, they like to use nonsense syllables, trusting in the tables showing their association values. However, as has been seen above, the results of studies into the reliability of association values are not always consistent. Certain research results show that there is a clearly positive relationship between association values and learning; others, on the other hand, do not. This leads the author to make the subject of the present study the answer to the question: What are the conditions under which we can, perhaps with fair success, use the association values of nonsense syllables as indicators of the degree of difficulty of learning and remembering the same syllables, and under what conditions will the correlation between the association values of syllables and learning those same syllables be low? While considering this question the author shall, at the same time, try to find a viewpoint from which the inconsistent character of the research results outlined above would be understandable.

B. METHOD

1. *Subjects*

The test subjects were 120 students of the North Savo Civic High School, 39 men and 81 women. The age of the subjects was 16-23, average 17.35. None of the students had previously taken part in tests with syllables.

2. *Procedure*

All the subjects were first subjected to a preliminary test consisting of 17 different learning and memory tests. All of them were then given a syllable test which was carried out under the same conditions as the final test held later, except that there were other syllables in the syllable series to be learned. After this a group of 20 was selected from the subjects, half men and half women, which, as regards the age and numbers of points gained in the tests just mentioned, in composition corresponded as closely as possible with the group of 100 which was left after the selection. This remaining group of 100 was divided up on the same principles into half-groups as similar to each other as possible, A and B. Table 1 shows figures indicating the composition of the groups thus achieved.

One hundred slides were prepared for this study, each showing a three-letter nonsense syllable. The first and last letters were consonants, the middle letter a vowel. The Voigtländer Perkso automatic projector, in which the projection time of each slide could be regulated, was used.

The members of the 20-subject group were now given a learning and memory test and an association test. The former test was given to two subjects together, the association test to one at a time. The instructions for the learning and memory test were: "I am going to show you on the screen a series of 10 syllables, six times. Try to memorize the syllables, since afterwards you will be writing down as many of them as you remember."

TABLE 1
COMPOSITION OF THE GROUPS USED IN THE STUDY

Group	Results of syllable test Average	σ	Combined results of 17 learning and memory tests Average	σ	Age Average	σ
Main group (100 *S*s)	7.30	2.83	22.40	7.08	17.35	1.37
Group A (50 *S*s)	7.30	2.86	22.40	7.01	17.34	1.41
Group B (50 *S*s)	7.30	2.79	22.40	7.13	17.36	1.34
Group of 20 *S*s	7.40	2.76	21.00	5.50	16.95	0.80

In the association test the same series of syllables was shown twice in succession and the following directions were given to the subject: "In a moment you will see a syllable in front of you. If this syllable brings some word or thing to your mind, tell me what it is immediately. Please do not make any deliberate effort to link the syllable you will see with a word or anything of the kind, but if something comes to your mind automatically, tell me what it is." The experimenter's assistant, who was sitting in the test room a little to one side, wrote down all the subject's reactions. In both the learning and memory test and the association test, each syllable was shown for 2.3 seconds. There was a 6-second gap between the sequences. Since there were 100 syllables to be learned and 10 syllables in each series, there was a total of 10 series. Each subject had to do two series on each day.

To avoid the effect of serial position the tests were carried out in such a way that the series were systematically rotated from one *S* to another and the syllables systematically rotated within each series. For example, if the *S* began series I from syllable number one, he began the second series from syllable two and ended at syllable one and so on. Thus each syllable had to be learned, and the association stimulated in the same way in each serial position, and each separate series was equally balanced.

C. RESULTS

In estimating the results of the test, one point was given for remembering each syllable. Since there were 20 subjects, there was a possible 20 points for each syllable. This is equivalent to the percentage 100. If 10 subjects remembered a syllable, it was given a percentage of 50, etc. Below the word "memory value" is used for these percentage figures, by which the author means the result of the learning and memory test mentioned above in terms of a percentage. Since in the association test each series was shown twice and the reactions each time were taken into account, the highest number of points that a syllable could get was 40, which thus equals the percentage 100. If, for example, a syllable produced a reaction 16 times, the percentage figure was 40. The percentages thus obtained are called "association values." It should be noted that the results are from Finnish verbal experience. The results of the test are given in Table 2.

The standard deviation in memory values of all 100 syllables in Table 2 is 15.10 and that in association values 33.36. When, with the use of the coefficient of variability, calculation is made of the relative variability values for these absolute figures, we get for memory values V_1—117.78 and for association values V_2—139.29. The averages of the memory values for the various series (à 10 syllables) vary between 53.0 and 72.0 and the averages for association values between 40.8 and 70.0. A variance analysis shows that the differences between the averages for the memory value of the 10 series ($F = 1.40$, 9 and 90 *df*, $p > .05$) and, similarly, the differences in averages in the association values ($F = 0.64$, 9 and 90 *df*, $p > .05$) are not significant.

In order to check up on whether the effect of serial position had been eliminated in learning the syllables, the author added together the memory values of the first two (nos. 1 and 2) and the last two (nos. 9 and 10) syllables in each series from Table 2. Similarly, a count was made of the memory values of the four syllables in the middle (no. 4 to no. 7). The total for both the middle and the end syllables happens to be exactly the same, 2555: i.e., 63.88 per syllable.

A clear picture is produced of the relationship between the association value and the memory value, which is the question of this study, by calculating the correlation between these values on the basis of Table 2. The Pearson product-moment correlation between the memory and association values of all 100 syllables in the table is .69 ($t = 9.49$, $p < .01$). If, on the other hand, the corresponding correlation coefficients are calculated separately for each syllable series, the results are as follows: Series I, $r = .42$; series II, $r = .54$; series III, $r = .71$; series IV, $r = .91$; series V, $r = .83$; series VI, $r = .67$; series VII, $r = .76$; series VIII, $r = .65$; series IX, $r = .44$; and series X, $r = .84$.

The chi square test indicates that the differences between the above 10 correlation coefficients are not significant ($\chi^2 = 7.617$, 9 *df*, $p > .05$). The average $z' = 0.893$, which is equivalent to $r = .71$.

TABLE 2
THE MEMORY AND ASSOCIATION VALUES OF 100 SYLLABLES IN FINNISH VERBAL EXPERIENCE

Series	Syllable	Memory value	Association value	Series	Syllable	Memory value	Association value	Series	Syllable	Memory value	Association value
I	HEV	70	80		TES	85	90		KOL	80	92.5
	KIR	95	92.5		SUP	50	72.5		JÄM	65	67.5
	BAL	80	62.5		ZIV	40	7.5		NOK	75	100
	KEM	60	85		VEL	75	97.5	VIII	NOR	95	92.5
	JÖR	60	72.5		SEB	60	57.5		SYT	55	85
	MUK	60	80		HUN	70	77.5		RIN	80	82.5
	DÖF	55	0	V	BÖN	45	0		SÄG	55	27.5
	LIS	85	65		HAS	80	77.5		TÄL	60	72.5
	LEN	75	82.5		JEL	50	25		VER	80	97.5
	HOM	80	75		LUK	65	97.5		NAM	65	40
II	GÄM	50	30		KYT	70	70		KYN	70	95
	HAL	80	95		KEG	60	30		BEJ	55	10
	JUG	50	52.5		LÄS	55	57.5		SAL	75	97.5
	MYS	75	87.5		MIV	60	15	IX	KAN	85	95
	LÖP	55	35		PIT	80	95		DOL	90	57.5
	KOS	80	82.5		MÄR	85	95		KÄT	55	70
	FAM	55	17.5	VI	NAP	65	95		LUR	75	47.5
	HYN	55	67.5		RÄV	35	20		NÄS	55	47.5
	KIB	45	27.5		SÖL	35	5		MAD	55	82.5
	LAJ	40	90		PÄS	75	75		SER	65	85
III	NÄD	30	7.5		TAD	55	42.5		VEP	70	27.5
	PEL	55	100		TÖS	45	12.5		NÖM	40	0
	RUG	50	20		VAL	75	100		FIK	60	30
	SEK	60	72.5		VUR	75	12.5	X	TYK	70	87.5
	SÄM	60	50		TYM	35	35		MAF	50	10
	ZEB	50	20		VAF	35	10		DUK	50	12.5
	VOS	70	70	VII	BIH	50	7.5		MIR	90	100
	TUL	85	95		JAN	85	77.5		TAM	85	100
	VIN	90	85		HIN	75	87.5		TUV	65	42.5
	TOR	60	95		KUR	65	100		LUS	80	75
IV	NYJ	35	5		MUB	45	0		GED	55	10
	PÄR	75	95		LYN	70	25		KUV	65	97.5
	RUS	70	90		LID	65	27.5		TEK	70	92.5
	SOV	65	75								

Merely on the basis of the correlations given above we could, however, get a misleading concept of the matter to be interpreted. It is noticeable that in using syllables as material for research, investigators usually aim at getting sequences in which the various syllables are as equal in association value as possible. How do the association and memory values of such series correlate with each other? To study this point, the author has taken all the 13 syllables with the lowest association values (i.e., zero-10 per cent) and all the 11 syllables with the highest association values (97.5-100 per cent) from Table 2 and made up various sequences of these. When the correlations between the association and memory values of the two series thus gained are then calculated separately for each series, the result is as follows: (*a*) series of lowest association value level, $r = .05$ ($t = .17$, $p > .05$); and (*b*) series of highest association value level, $r = .11$ ($t = .33$, $p > .05$). Neither correlation coefficient differs significantly from zero.

In addition, three series were similarly made up on the basis of memory values. All the syllables with the lowest memory values in Table 2—i.e., 30-45 per cent (total 13)—all those with medium memory values—i.e., 60-65 per cent (total 21)—and all those with the highest memory values—i.e., 85-95 per cent (total 12)—were taken, and the correlations between the memory and association values thus achieved for the three series were then calculated separately for each series. The result is as follows: (*a*) series of lowest memory value level, $r =$ zero; (*b*) series of medium memory value level, $r = .25$ ($t = .13$, $p > .05$); and (*c*) series of highest memory value level, $r = .02$ ($t = .06$, $p > .05$). None of these correlations differs significantly from zero.

The author specified the memory values of the syllables immediately after learning on the basis of recall tests. The study must now aim at clearing up the question of how far the memory values gained can be used as indicators of the degree of difficulty of retention in the memory. For this purpose the author carried out a test in which the *S*s formed Groups A and B. Group A were shown six times 12 syllables taken from those with the lowest memory values (i.e., 30-45 per cent) in Table 2. Each syllable was shown for 1.8 seconds and there was a six-second break between series. The syllables were thus shown on a 6 × 1.8 × 12 plan. Group B were similarly put to learning the 12 syllables with the highest memory value in Table 2.[1] Immediately after studying them, each group had a test. Another test was given the next morning, 12 hours later. The procedures the author employed

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[1] Since it is not possible to put the syllables JAN-KAN or MIR-KIR in the same series, we took, instead of JAN and MIR, syllables HAL and VER, which have a memory value of 80. The other syllables in the series belong to memory value group 85-95 per cent.

TABLE 3

RESULTS OF A TEST ON THE LEARNING AND REMEMBERING OF SYLLABLES IN THE LOW AND HIGH MEMORY VALUE GROUPS

		Immediate test				Second test			
Group	Number of subjects	No. of syllables recalled	Per subject	σ	CR	No. of syllables recalled	Per subject	σ	CR
A	47	248	5.28	2.45	11.16	178	3.79	2.52	10.60
B	48	489	10.19	1.66		452	9.41	2.55	

to try to prevent repetition between the tests have been described in an earlier study (14). The results of the testing are given in Table 3. Group B learned almost twice as many syllables with a high memory value per person (= 10.19) as Group A did syllables with a low memory value (= 5.28). The high CR value shows that the difference between Groups A and B is extremely significant.

The difference between the groups is higher still when comparison is made of the number of points gained 12 hours later. Group B, which had learned syllables with a high memory value, had remembered 9.41 syllables per *S;* Group A, only 3.79 of the low memory value syllables. The average number of forgotten syllables per *S* in Group A is 1.49 and in Group B .78. When we count the average errors in the averages for the differences between these correlated observations, we get $\sqrt{.0315}$ for Group A and $\sqrt{.0483}$ for Group B. The CR value is then 2.52, which is at a 5 per cent significance level. Forgetting has thus been significantly higher for syllables with a low memory value.

The correlation between the results gained in the first immediate and second test is .88 ($t = 12.30$, $p < .01$) for Group A and .82 ($t = 9.75$, $p < .01$) for Group B.

D. Discussion

When the series taken for study are very varied as to the memory and association values of the syllables they contain, and the syllables thus differ greatly from each other, the correlation between the association and memory values is always positive and, on the average, taking all our material into account, moderate. It is nevertheless very different for the various series, varying from .49 to .91. If, on the other hand, the series includes, *as is usual in researches,* syllables with as similar association values as possible, the correlation between the association and memory values has been shown to be very slight (.05 and .11). The result is similar when this correlation is calculated within the limits of our material for syllables which have memory values as homogeneous as possible. *Predicting an individual memory value on the basis of association value, and* vice versa, *has proved very unreliable.*

Certain other facts indicate that drawing up a formal forecast on the basis of association values is difficult. Since various researchers have carried out the same test—i.e., fixing the association value with the *same syllables* (there have, it is true, been slight variations in the techniques used)—one would expect that the correlation between these results would be very high. This would be important, inasmuch as we are using syllables as, for example, homogeneous test material for research. The association values gained by various researchers for the same syllables are not, however, always compatible. Several studies have been made on this point. Peixotto (19) selected 300 syllables which were common to the material of Glaze, Krueger, and Hull. When he calculated the correlations for the association values of these syllables according to the tables published by each of these researchers, the result was as follows: Glaze *vs.* Krueger .65, Glaze *vs.* Hull .62, and Krueger *vs.* Hull .70. When Mandler (16) compared his own and Krueger's results for these 100 syllables common to both, the corresponding correlation was $r = .65$. In the case being discussed, when the association values gained for the same syllables are compared, these r-values must be considered rather low in this respect. High correlations have, however, also been reported. Noble, Stockwell, and Pryer (18), whose material contained 100 syllables that were the same as Glaze's and Krueger's and 21 the same as Hull's, got the following figures for the correlation coefficient between their association values: Glaze *vs.* Noble, Stockwell, and Pryer .81; Krueger *vs.* Noble, *et al.* .90; but Hull *vs.* Noble, *et al.* only .55. They also got a correlation of .86 (for 100 syllables) between the Glaze and Krueger values, whereas Peixotto had got only .65 for 300 syllables. When Archer (2), on the other hand, calculated the mutual correlations between the syllable association values gained by three researchers (Archer, Glaze, and Krueger) separately for certain fixed levels (1-25, 26-50, 51-75 and 76-100 per cent), these product-moment correlations were rather low, ranging from .16 to .59.

In the early part of this study, it was noted how the various research results for the relation between speed of learning and the association values of syllables do not always correspond. How should this contradiction be understood in the light of the results of the present research? To clarify this matter, in the following, each previous research mentioned above will be studied more closely. Young (25), Goulet (9), and Underwood and Richardson (22) compared the learning of lowest association value and highest association value syllables with each other; Davis (4), the learning of meaningful one-syllable words and nonsense syllables with the lowest association values. The variations between the association values were thus very great, and at the same time there was also a very clear positive relationship between the association values and the speed of learning. This was also the case with the Underwood and Schultz (23) studies. The material to be learned which they used included meaningful, generally used words (AND, CAT, RAT, etc.), ordinary nonsense syllables (MEL, XYZ, etc.), and finally combinations of unattached consonants (RZQ, HTG, etc.). The trigrams thus differ very distinctly from each other as regards association values. The correlation between learning and association values was then .80. From our own study it has appeared that if syllables differing greatly in association values must be learned, the association values have an undeniable positive relation to the memory value and that the correlation between these two is considerable. Since the 100 syllables to be learned in our study in their entirety did not differ from each other in association value nearly as much as, for example, the 22 trigrams used by Underwood and Schultz, it is, in the light of our research results, understandable that the correlation between the memory and association values for our own material (= .69) is smaller than that of Underwood and Schultz (= .80).

On the other hand, we have shown that according to the research results of Hull (12), Mandler and Huttenlocher (17), and Sarason (21), either there was no logical relation, particularly in regard to detail, between learning and association values, or the differences in learning syllables with different association values were slight. But in all the above-mentioned studies the syllables to be learned differed relatively little in association value. The results of these studies thus again contribute to the impression the author got from his own material that if the syllables to be learned are very compatible in association value or only slightly different, the correlation between learning and association values is low, and predicting learning on the basis of association values is thus very unreliable.

The correlation between the results of tests carried out immediately after study and 12 hours later was, according to our material, rather high (.82 and .88). This indicates that learning and retention after learning are closely related.

Underwood and Richardson (22) have shown that there was no difference in retention over 24 hours for high and low association value syllables. When our own study similarly compared syllables with high and low *memory values,* it appeared that over 12 hours significantly more low memory value syllables had been forgotten than high ones. Should the shorter period for retention in the latter case not be of any influence, the result may indicate the possibility that syllables classified by memory and by association values are retained in the memory in a different way.

E. SUMMARY

From the main group of 120 *S*s, 20 were chosen on five days to memorize $10 \times 10 = 100$ nonsense syllables. After memorizing each series, they were given a memory test, on the results of which each syllable was given a "memory value." The same syllables were given the usual association values through an association test. Predicting the degree of difficulty of learning the syllables and retaining them in the memory on the basis of their association value proved unreliable. The correlation between the association and the memory values varied in the different series from .42 to .91, but when the syllables chosen for a series were—as is usually the case in researches—of fairly equal association value, the respective correlations were only .05 and .11.

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Pitkänlahden asema, Kuopio
Finland

Published as a separate and in *The Journal of Psychology*, 1967, **67**, 17-24.

SOME EFFECTS OF VARIOUS SCHEDULES OF VERBAL REINFORCEMENT ON SELF-REFERENCE RESPONSES*

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A. Introduction

Following Skinner's operant conditioning paradigm, and stemming from the work of Greenspoon (3), Verplanck (12, 13), and Wilson and Verplanck (14), subsequent experiments have demonstrated in detail that a wide variety of behaviors can be manipulated through verbal reinforcement. The studies have also demonstrated that such conditioning can occur without the *S*'s awareness of his having been conditioned. Osgood (5) proposed a mediation hypothesis which postulated that verbal manipulation of the meaning of verbal labels could be employed to modify verbal behavior toward the object signified by the label. Staats and Staats (10) investigated the generalization from object to sign and sign to object, using both autonomic and verbal responses. Evidence for sign-to-sign conditioning of meaning to verbal stimuli is substantial (9, 10, 11). The variables of verbal conditioning appear to follow the established principles of the conditioning situation. As an extension of these findings, we were interested in investigating any effects of partial or continuous verbal reinforcement schedules on the rate of and the extinction of the *self-reference* responses.

Along these lines, Raimy (6) demonstrated that increase in positive and decrease in negative self-reference occurred in successful therapy. Heine (4) suggested that psychotherapists, without awareness or intention, influenced patients' verbal production through selective verbal reinforcement. Carl Rogers and Diamond (7) concluded that one important change occurring in psychotherapy is the modification of the patient's self-concept. Adams and Frye (1) found that, in psychotherapeutic interviews, interpretative statements and minimal social reinforcement increased personal references, while reflections and hostile references decreased it. J. Rogers (8) found interviewers produced changes in the *S*'s self-referential verbalizations by consistently reinforcing a class of such statements. Rogers did not, however, employ various schedules of reinforcement nor did he try to measure extinction of

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* Received in the Editorial Office, Provincetown, Massachusetts, on May 24, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

self-reference responses of his subjects. Extensive work on schedules of reinforcement has been done by Ferster and Skinner (2). Although their research was confined almost exclusively to the free-responding behavior of rats and pigeons, the authors suspect that their data on the effects of various schedules of reinforcement on the instrumental or operant bar-pressing and key-pecking reactions would be similar to data obtained from applying various schedules of verbal reinforcement on self-reference responses.

The hypotheses that the authors were most interested in exploring were (*a*) that the group of *S*s that were conditioned under continuous verbal reinforcement will emit a significantly higher number of self-referential responses than the control group during the *acquisition phase* of the experiment; (*b*) that during the acquisition phase, the group reinforced under the partial reinforcement schedule (fixed ratio 2:1) will emit a lower frequency of self-referential responses than the group conditioned under the continuous verbal reinforcement schedules; (*c*) that the group conditioned under a continuous verbal reinforcement schedule will emit a higher frequency of self-reference responses than the control group during the extinction period; and (*d*) that the group conditioned under the partial reinforcement schedule (fixed ratio 2:1) will emit a higher frequency of self-referential responses than the group conditioned under the continuous schedule of verbal reinforcement during the extinction period.

B. METHOD

1. *Subjects*

Ninety-seven student volunteers from classes in introductory psychology at California State College, Los Angeles, were screened. A total of 30 males and 30 females, ranging in age from 17 to 24, were chosen. A *t* test showed no significant difference between the means of groups in intelligence, as measured by the American Council on Education Aptitude Battery. Only those *S*s who emitted not less than one and not more than six self-reference responses per picture during the pretraining period were used. It was impossible to insert *E*'s reinforcing responses between the various self-referential remarks made by those *S*s who spontaneously gave more than six self-reference responses per picture; so they were screened out. Each selected *S* was randomly assigned to one of three groups; Group I received continuous reinforcement during the training period; Group II received partial reinforcement (fixed ratio schedule 2:1); Group III, the control group, received no reinforcement.

A self-reference response is operationally defined as any verbal response emitted by the subject which describes himself ("That boy looks like me when

I was five."), tells something about himself ("The doll reminds me of my old doll."), or refers to any affect he experienced ("I feel sad looking at it."). The response, when emitted, was given a score of one, coded as a *unit* of *response*. The response-unit scoring method constitutes a synthesis of "thought unit" and "sentence unit" techniques employed by J. Rogers (8). Reinforcement in this study consisted of *E*'s saying "Mm-hmm" approvingly and nodding his head in approval.

The instructions given to all *S*s were, "I am doing a study on the recall of early memories. I am going to show you a series of pictures. After each picture, I want you to make one statement about any memory that the picture brings to your mind. Please do not merely describe the picture. If you have any questions or if you don't understand the task, ask me now." The questions were repeated and questions answered upon *S*'s request. During the experiment *E* avoided answering further questions by saying, "I cannot give you any information until the experiment is over."

2. *Apparatus*

The experiment was carried out in a soundproof room with a table and two chairs. Three silent push-button switches were attached to *E*'s side of the table, out of sight of the *S*. The switches were wired to an Esterline-Angus Event Recorder, which recorded all of *S*'s responses (Switch A), *S*'s self-reference responses (Switch B), and occurrence of verbal reinforcement (Switch C). Pictures were laminated with transparent plastic and set in a standard 8-inch × 11-inch photograph album. Each page contained one picture. Seventy pictures in all, they were divided into blocks of experimental trials, each block containing 10 pictures.

3. *Procedure*

E made acquaintance with *S*, read instructions, answered questions, and presented *S* with picture album. *E* then turned picture pages at the rate of one picture per 30 seconds and recorded *S*'s responses. The experiment was divided into three periods: pretraining (Block of trials 1, Pictures 1-10), acquisition period (Blocks 2, 3, 4; Pictures 11-40), and extinction (Blocks 5, 6, 7; Pictures 41-70). Each *S* went through all three stages without being aware of their differentiation.

In pretraining (Trial block 1), *E* presented Pictures 1-10, recorded responses, avoided any behaviors that might be interpreted as reinforcement by *S*. During the acquisition period (Blocks of trials 2, 3, 4), *E* presented Pictures 11-40; recorded responses; gave Group I continuous reinforcement for every self-reference response, Group II partial reinforcement, Group III no reinforcement. In the extinction period (Blocks of trials 5, 6, 7; Pictures 41-70), no verbal reinforcement was given to any *S*. In this stage *E* avoided any behaviors that could be interpreted by any *S* as reinforcing. A short interview followed the extinction period. It indicated that no *S* was aware of the purpose of the experiment.

C. Results

In Table 1, results of a simple analysis of variance for Block of trials 1 (Pictures 1-10)—the pretraining period—yields an F of .08 ($df = 2.27$). Groups did not differ initially in mean frequency of self-reference responses. In the acquisition period (Blocks of trials 2, 3, 4; Pictures 11-40), Groups I and II (the reinforced groups) emitted significantly more self-referent responses than their controls (Group III). During the extinction period (Blocks of trials 5, 6, 7; Pictures 41-70), the number of self-reference responses decreased.

TABLE 1
MEAN FREQUENCIES OF SELF-REFERENCE RESPONSES IN PRETRAINING, ACQUISITION, AND EXTINCTION PERIODS

	Pre-training period	Acquisition period			Extinction period		
Groups	Trial block 1	Trial block 2	Trial block 3	Trial block 4	Trial block 5	Trial block 6	Trial block 7
Group I	1.80	3.60	4.90	6.20	3.00	3.10	3.20
Group II	1.90	4.20	4.70	5.10	3.70	4.10	3.10
Group III	1.70	1.80	1.90	1.90	1.80	2.10	2.30

A 3 × 2 analysis of variance, comparing acquisition-stage Trial blocks 2 and 4 (comparing Picture-series 11 through 20 with 31 through 40), shows that the difference in number of self-reference responses between groups is significant ($p < .01$), but the difference between the first and third phases

TABLE 2
ANALYSIS OF VARIANCE OF THE MEAN FREQUENCIES OF SELF-REFERENCE RESPONSES IN TRIAL BLOCKS 2 AND 4 OF THE ACQUISITION PERIOD

Source	*df*	*Ms*	*F*
Groups (A)	2	47.35	33.10**
Error (a)	27	1.40	
Blocks (B)	1	1.60	1.53
A × B	2	66.3	63.64**
Error (b)	27	1.04	

** $p < .01$.

of the acquisition period (Blocks of trials 2 and 4) is not significant (Table 2). A significant interaction ($p < .01$) suggests that the response rate during the first and third trial blocks of the acquisition period (Blocks of trials 2 and 4) was a function of the treatment variable.

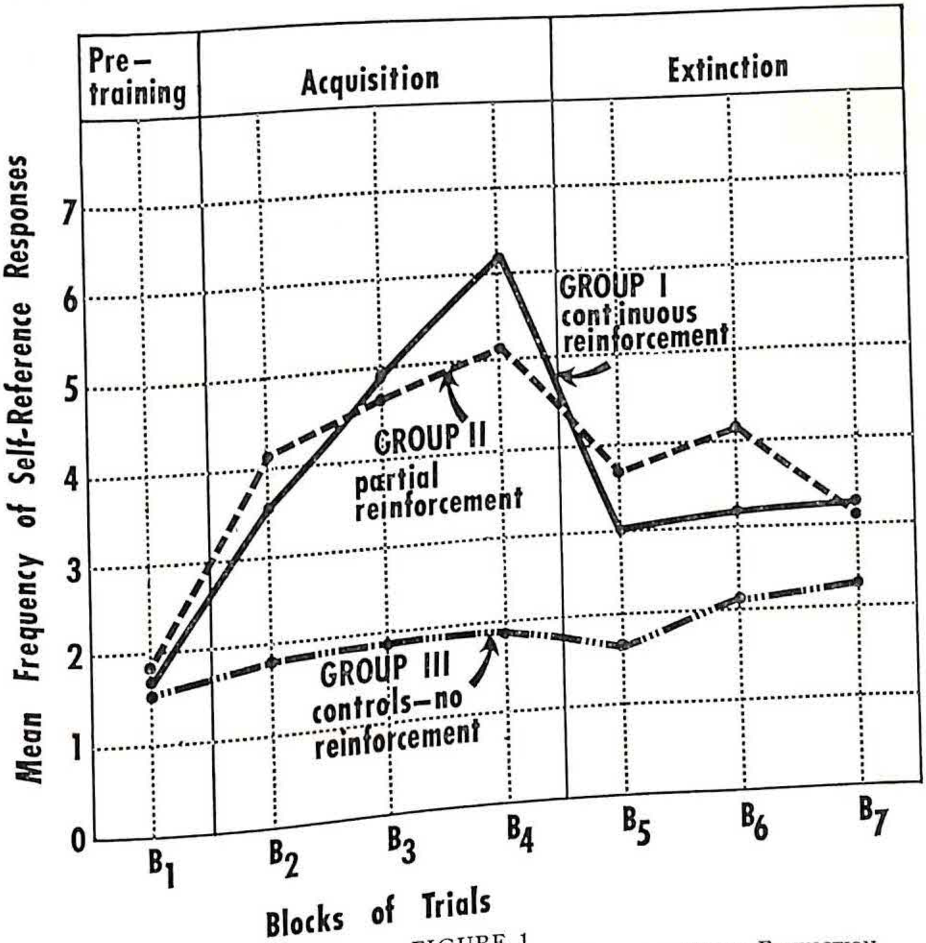

FIGURE 1

Verbal Conditioning of Self-Reference Responses and Their Extinction

That both experimental groups (Groups I and II) increased their mean frequencies of self-reference responses from the first to third blocks of trials in the acquisition period (Blocks 2 and 4) is shown in Figure 1. Group I, the continuously reinforced group, attained a mean of 14.7 self-reference responses in this stage, significantly higher than Group II's 14.0, and Group III's mean of 5.4 (*cf.* Figure 1). A 3 × 2 mixed analysis of variance was computed to ascertain the occurrence of extinction and to determine whether groups differed in the frequency of self-reference responses during the extinction period. This was done by splitting the extinction phase into the three Blocks of trials, 5, 6, 7, and comparing the first and third blocks of trials in the extinction process (Blocks 5 and 7). The summary of this analysis (Table 3) indicates significant differences between the groups ($p < .05$), but not between the blocks of trials. A significant interaction ($p < .01$) between the two variables suggests that the rate of self-reference responses made in the first and third blocks of trials of the extinction stage was a function of the treatment variable. The mean frequency of self-reference responses decreased for both experimental groups during the extinction stage (*cf.* Figure 1). During extinction, Group I's total was 186; Group II's, 218; and Group III's, only 124.

TABLE 3
ANALYSIS OF VARIANCE OF THE MEAN FREQUENCIES OF SELF-REFERENCE RESPONSES IN TRIAL BLOCKS 5 AND 7 OF THE EXTINCTION PERIOD

Source	*df*	*M*s	*F*
Groups (A)	2	10.05	4.25*
Error (a)	27	2.34	
Blocks (B)	1	.01	.004
A × B	2	16.675	7.61**
Error (b)	27	2.19	

* $p < .05$.
** $p < .01$.

D. DISCUSSION

It was found that both partial and continuous reinforcement increase the mean frequency of self-reference responses. Experimental Groups I and II emitted a higher frequency of the responses than did their controls. Group I, reinforced under a continuous reinforcement schedule, emitted a higher frequency than did Group II (the partially reinforced). These results are consistent with most reports of studies of operant conditioning. Schedules of reinforcement have long been known to be important in conditioning. In this study, self-reference responses acquired under partial reinforcement tended to be more difficult to extinguish than those acquired under continuous reinforcement.

The results of this study tend to support the proposition that the parameters of verbal reinforcement on self-reference responses operate in much the same fashion as those parameters of primary reinforcement that are established as facts in contemporary literature on operant conditioning.

One conceivable implication of this study is that, recognizing the importance of self-referential statements in the clinical and the counselling situations, the application of intermittent reinforcement of patients' self-referential statements might be used to change some symptomatic response patterns. Perhaps all of the known variables of operant conditioning are applicable to verbal conditioning and should be investigated.

E. Summary

Sixty college students, in three groups, were compared with respect to the effects of the use of various schedules of reinforcement on emitted self-reference responses. Group I was given continuous, Group II partial (fixed ratio schedule), and Group III, the control, no reinforcement. Performance was compared in pretraining, acquisition, and extinction phases. Both partial and continuous positive verbal reinforcement were found to increase the mean frequency of self-reference responses. The group reinforced with continuous reinforcement emitted a higher frequency of self-reference responses than did the group with the partial reinforcement schedule. It was also noted that self-reference responses acquired under partial reinforcement tended to be more difficult to extinguish than those acquired under continuous reinforcement. The application of intermittent reinforcement in changing patients' symptomatic responses has implications for the practice of psychotherapy.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 25-45.

COGNITION AND RISK TAKING IN A CLASSROOM SETTING: TWO METHODOLOGIES*

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A. INTRODUCTION

This report is part of an investigation in progress of the combination of judgment and guessing that is called risk taking. The investigation is being conducted in the classroom setting where the outcome is the very real determination of the students' grades for the course. The purpose of this article is to describe two new methodologies, with variations, that have been developed for the study. The authors are describing the methodologies at this time for two reasons. First, the space demands of journals would preclude an adequate description in combination with the report of the research and analyses of the data. Secondly, the authors would like to make these methodologies available to interested psychologists and educators for their own use or separate development without waiting upon final publication of the series of investigations now in progress.

B. BACKGROUND

It has long been recognized that objective tests of the true-false or multiple-choice variety provide much leeway for the expression of guessing, as well as for the measurement of accurate knowledge (3). The occurrence of guessing on objective tests is widely interpreted as reducing the validity of the test by attenuating the relationship between the test score and actual knowledge (2, 3). In addition, guessing behavior appears to be an expression of personality variables which may or may not be construed to be of cognitive merit (5). Therefore, a variety of techniques have been utilized to investigate, control, or utilize guessing behavior in the objective-testing situation.

Swineford (7, 8) investigated the correlates of guessing behavior by defining and measuring guessing behavior independently of the right-or-wrong scoring of the subject's answer. This was done by providing optional extra credit on any question with the proviso that an erroneous claim for extra credit would

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* Received in the Editorial Office, Provincetown, Massachusetts, on May 24, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

penalize the subject's score by double the amount of the claimed credit. Unfortunately, about 25 per cent of the subjects did not provide usable data, either because they had 100 per cent of the items correct or because there was no attempt to gain extra credit.

A widely-used technique for controlling or eliminating guessing is to penalize the subject for each wrong answer. The conventional formula for such corrections is Total Score = Rights — (Wrongs/(n-1)), where n is equal to the number of options that are offered for a question. For example, when the correction formula is applied to a five-choice, multiple-choice test, each incorrect response will reduce the total score by one-fourth of a point. Omissions are not scored. More severe corrections than the above-mentioned formula have sometimes been used to control guessing behavior, such as subtracting one point for each incorrect response (4). However, neither the conventional correction nor the more severe correction is effective in its aim of eliminating guessing behavior, due, at least partially, to stable individual differences in risk taking or the tendency to gamble (3, 5). In addition, there is some indication that (extraneous) personality variables are effective determinants of test results when such controls are applied, thereby penalizing subjects who are more submissive (9) or anxious (6). The implication of these results is that such control procedures introduce an element of personality evaluation into what is intended to be a cognitive evaluation when students, as contrasted to subjects, are involved.

The Coombs technique is a more recent attempt to utilize guessing behavior, rather than eliminate it, which has gained a prominent position in the testing literature (1, 2). The technique provides for the graded expression of partial knowledge, where partial knowledge is defined as the ability to detect one or more erroneous answers without the completion behavior of detecting the correct answer. This is accomplished by instructing the subject to eliminate incorrect answers and by providing one credit for each incorrect answer that is eliminated. If all incorrect answers are eliminated on, say, a four-choice question, the subject accrues three points. However, if the correct answer is eliminated, the subject loses three points. The subject many accrue one, two, or three points by appropriate eliminations, or he may lose three points by an inappropriate elimination, or he may lose one or two points by a combination of appropriate and inappropriate eliminations, or he may neither lose nor gain points by eliminating all four answers or not eliminating any answers.

The intention of the Coombs technique is to control guessing behavior by utilizing what is presumed to be its underlying cognitive component: the possession and awareness of partial knowledge. If it is successful in this desired goal, the technique could then be used to investigate the relationships between social and personality variables with cognitive variables, such as test or course achievement or the expression of partial knowledge, without the prior contamination of the test scores by the effects of the personality variables.

It was the authors' intention to investigate the relationships between risk taking in a classroom setting and selected social and personality variables. The choice of a classroom setting was dictated by the desire to achieve reality in the taking of risks and the subsequent payoffs. Reality could be well achieved if the usual class examinations provided the risk-taking task and the students' grades constituted the payoffs. It was within this context that the authors evaluated the Coombs technique for possible use.

Analysis indicates that the Coombs technique is basically no different than are the other techniques that provide controls against guessing behavior. Although it is conceptually and operationally different than the conventional use of penalties for incorrect responses, it contains within it, as an inherent property of the technique, a metric that would appear to elicit individual differences in risk taking or gambling, or reflect individual differences in anxiety or submissiveness. For a given number of correct answers, a tendency to make more eliminations will tend to produce a higher Coombs score than will a tendency to make fewer eliminations. Therefore, it appears to be no less susceptible to a confounding of personality variables with evaluation of test-oriented cognitive behavior than are the other techniques. In our judgment, then, this property renders it unsuitable for research in which the role of subject is combined with that of student.

An illustration of our analysis of the Coombs technique, utilizing a four-choice series of test questions, is presented in Figure 1. In this situation the technique provides a gain of one point for each appropriate elimination and a loss of three points for each inappropriate elimination. The row heading, No. of Correct Responses, indicates the number of correct choices that are made by a subject on a 10-item test using the conventional method of selecting the correct answer. The column heading, No. of Eliminations, indicates the number of eliminations that are made by a subject on each of the items using the Coombs technique. For purposes of exposition, the analysis has been derived assuming a constant use of one, two, or three eliminations by a subject.

The body of the analysis indicates the resulting minimum point total that would be obtained if the test were taken, with each of the two methods used separately. The data are computed by adding the number of appropriate eliminations for the number of correct responses and subtracting the excess of three times the number of incorrect responses minus the number of appropriate eliminations for the incorrect responses.

In other words, Total Score = $n \times$ Rights — (3 $\times$ Wrongs — (n-1) Wrongs), where n is equal to the number of eliminations per item. For example, one elimination for each of 10 correct responses produces 10 appropriate eliminations for a total score of 10 points; three eliminations for each

	No. of Eliminations		
No. of Correct Responses	3	2	1
10	30	20	10
9	26	16	6
8	22	12	2
7	18	8	- 2
6	14	4	- 6
5	10	0	-10
4	6	- 4	-14
3	2	- 8	-18
2	- 2	-12	-22
1	- 6	-16	-26
0	-10	-20	-30

FIGURE 1
ANALYSIS OF THE COOMBS TECHNIQUE: OUTCOME SCORES (ACTUALLY, *Minimum* OUTCOME SCORES)

of 10 correct responses produce 30 appropriate eliminations for a total score of 30 points. When there are nine correct responses, one elimination produces nine appropriate eliminations (+9), for the nine correct responses, and one inappropriate elimination (—3), for the incorrect response, for a total score of six points; three eliminations for each of the nine correct responses produce 27 appropriate eliminations (+27), plus two appropriate eliminations and one inappropriate elimination for the incorrect response (—1 net) for a total score of 26 points. (Actually, a series of binomial expansions provides a more complete and accurate derivation with somewhat different tabled values. However, all of the relevant characteristics of Figure 1 remain the same, so that the simpler illustrative presentation of Figure 1 is sufficient.)

At all points in the figure, a subject would obtain a higher score if he utilized more, rather than fewer, eliminations. There is, therefore, no reason to expect that the Coombs technique is any more successful than the conventional penalty-for-guessing method in controlling guessing behavior by its utilization without the intrusion of such contaminating variables as anxiety, submissiveness, or cautiousness. In fact, the elimination procedure appears to us to provide misleading cues, inasmuch as the approach of "playing it safe" by making only one elimination per item is actually the most punishing of tactics.

C. ITEM-TAKING STRATEGIES

The authors have devised a system of selective weighting, called the Item-Taking Strategies (*IT*s), for use with individual items. The *IT*s provide an adequate metric for the control of the effects of personality variables upon test scores and the effects of cognitive achievement (test scores) upon risk taking. At the same time, they permit the utilization of guessing behavior or risk-taking behavior in the investigations of personality-social variables and test-taking behavior.

There are two essential elements to the derivation of the *IT*s. First, the making of a response (attempt to choose a correct answer) is separate from the weighting of the response—that is, the attempt to maximize or minimize its importance in securing a grade. The separation of the response itself from the weighting of the response has the great, perhaps necessary, advantage that examinations can be graded independently of the weightings, with the weightings being used for research purposes or as a separate grade source. Secondly, a variable ratio of potential loss to potential gain, called the *decision ratio,* is used. The decision ratio increases as the subject selects a higher weighting for his response. In other words, as a higher potential gain for a response is sought by the subject, he must also risk an even greater relative increase in potential loss. The relatively greater increase in potential losses as higher potential gains are sought is tailored to the metric of the test so that average risk-taking tendency, as reflected in the selection of weights, is balanced against average cognitive ability, as reflected in the test score. The point of equal balance, or neutrality, between average risk-taking selections and average cognitive achievement is called the *nullification level,* or the level of test score at which an indiscriminate use of a particular weighting selection is nullified, thereby producing neither gain nor loss from the use of the weightings. The construction of the *IT*s produces a higher nullification level for risk taking as the test score increases and, conversely, a lower nullification level for risk taking as the test score decreases.

	Abigail	Belinda	Carol	Daphne	Eloise	Flora	Gwendolyn	Hildegarde
Deterrent/Incentive Value / Value	-25/+5	-12/+4	-6/+3	-3/+2	-1/+1	-.50/+.75	-.25/+.50	-.083/.+25
Decision Ratio	5:1	3:1	2:1	1.5:1	1:1	1:1.5	1:2	1:3
Variance	225	64	20.25	6.25	1.00	0.39	0.14	0.028
Raw Score Number Correct								
12	60	48	36	24	12	9.00	6.00	3.00
11	30	32	27	19	10	7.75	5.25	2.67
10	0	16	18	14	8	6.50	4.50	2.33
9	- 30	0	9	9	6	5.25	3.75	2.00
8	- 60	- 16	0	4	4	4.00	3.00	1.67
7	- 90	- 32	- 9	- 1	2	2.75	2.25	1.33
6	-120	- 48	-18	- 6	0	1.50	1.50	1.00
5	-150	- 64	-27	-11	- 2	0.25	0.75	0.67
4	-180	- 80	-36	-16	- 4	-1.00	0.00	0.33
3	-210	- 96	-45	-21	- 6	-2.25	-0.75	0.00
2	-240	-112	-54	-26	- 8	-3.50	-1.50	-0.33
1	-270	-128	-63	-31	-10	-4.75	-2.25	-0.67
0	-300	-144	-72	-36	-12	-6.00	-3.00	-1.00

FIGURE 2

ITEM-TAKING STRATEGIES (*IT*S): GAINS AND LOSSES RESULTING FROM THE INVARIANT APPLICATION OF EACH *IT*

A description and derivation of the *IT*s are contained in Figure 2. The derivation was based on our adoption of a 12-item test as the standard testing unit for the study. The tests are typically of 12 six-choice, multiple-choice questions. The combination of number of items and number of choices is more relevant to the Test-Taking Strategies of the next section. As for the *IT*s, the primary value of this particular combination of choices and items lies in rendering the test more difficult than the usual brief test of 10 four-choice, multiple-choice questions, thereby reducing the high incidence of unusable data encountered by Swineford (8) as a result of a low ceiling on performance.

There are eight *IT*s in Figure 2, ranging from *IT* Abigail at the high-risk end to *IT* Hildegarde at the low-risk end. The incentive value, or potential gain, of the *IT* increases from *IT* Hildegarde to *IT* Abigail, with a constant increase of .25 from *IT* Hildegarde to *IT* Eloise and a constant increase of 1.00 from *IT* Eloise to *IT* Abigail. The deterrent value, or potential loss, of the *IT* also increases from *IT* Hildegarde to *IT* Abigail, but by increasing amounts so that the decision ratio for *IT* Eloise is 1:1, less than 1.00 for the *IT*s to the right of *IT* Eloise and greater than 1.00 for the *IT*s to the left of *IT* Eloise. The variance of the incentive and deterrent values of the *IT*s also increases in rank magnitude with the decision ratios. (For purposes of convention, the terms *incentive value* and *deterrent value* refer to the potential gain or loss of the *IT*s; the terms *reward* and *risk* refer to the potential gain or loss of the selections made by the subjects; the terms *gain* and *loss* refer to the actual gain or loss of *IT* points by the subjects as a result of the correctness or incorrectness of response to an item in combination with the incentive value or deterrent value of the *IT* choice for that item.)

The data in the body of the figure indicate the *IT* points gained or lost for any given test score as a function of the invariant, undiscriminating application of risk taking as translated by the *IT*s. For example, if a subject consistently applies *IT* Carol and achieves 12 correct answers, his gain is equal to 36 *IT* points. If a subject consistently applies *IT* Carol and achieves 10 correct answers, he will gain 30 *IT* points for the 10 correct answers and lose 12 *IT* points for the two incorrect answers, thus producing a net gain of 18 *IT* points.

The nullification band in the body of the figure is the linear diagonal band of zero and near-zero values going from 10 correct items at *IT* Abigail to three correct items at *IT* Hildegarde. It is this linear nullification band that permits the assumption that the *IT*s provide a linear metric control of cognitive ability for indiscriminate risk taking and guessing.

The nullification band could have been extended one test score value upward, to the left, beyond *IT* Abigail, and one test score value downward, to the right, beyond *IT* Hildegarde. However, the upward extension would involve a deterrent value of 66 *IT* points, which seems unduly large, while the downward extension would involve infinitesimal incentive and deterrent values. In addition, scores of 11 on a 12-item, six-choice, multiple-choice test are not frequent; and a score of two corresponds to a purely chance level of response, or a score of zero on an open-ended test.

The *IT*s can be adapted to a variety of contexts. For example, they can be abbreviated into a coarse, but acceptable, scale by utilizing only *IT*s Abigail, Carol, Eloise, and Gwendolyn. They can be utilized with a true-false examination, maintaining the same linear nullification-band characteristics, by utilizing *IT*s Abigail through Eloise. In fact, our preliminary experience indicates that *IT*s Flora and Gwendolyn are applied only rarely so that *IT* Hildegarde is, in effect, a null choice. We have, therefore, adopted as our *Standard IT*s a set of six, *IT*s Abigail, Belinda, Carol, Daphne, Eloise, and Zelda, where *IT* Zelda is a null choice of zero incentive value and zero deterrent value.

The *Standard IT*s can be used with a test of any length *although it is most accurate with test-lengths that are multiples of 12*. A test consisting of 10 items, for example, would best utilize a somewhat different set of deterrent and incentive values for the *IT*s: that is, *IT* Abigail = —45/+5, *IT* Belinda = —16/+4, *IT* Carol = —7/+3, *IT* Daphne = —3/+2, *IT* Eloise = —1/+1, and *IT* Zelda = 0/0. A test consisting of 60 items can be served equally well by the *Standard IT*s, developed for 12-item tests, or by the set of *IT*s for 10-item tests.

A test of 60 items can also be served by a set of *IT*s developed specifically for 15-item, 20-item, 30-item, or 60-item tests. The increasing number of items for which a set of *IT*s is developed provides more accurate metric properties when used with a test of the same, or greater, length than does a set of *IT*s developed from a smaller number of items. However, a greater selection of *IT*s would have to be developed by the investigator, and provided for the student, in order to incorporate increasing accuracy into the system, so that it is not likely in the final analysis to be of much use.

The implication and utilization of the *IT* points is a variable that is at the service of the instructor or the investigator. In the classroom teaching situation, they can be used as an additional source of feedback for the instructor or the students, or they can be utilized in a variety of ways to adjust class grades either with or without the traditional "curve." For example, in one class, the authors defined the value of the *IT* points for the students as "30 *IT* points equal 5 per cent for the term's quiz grades." In this usage, there is a complete carryover of *IT* points over all quizzes during the course of the term. The quizzes are scored, either by traditional scoring procedures or by use of the Test-Taking Strategies described below, and then the final quiz grade is modified upward or downward by the appropriate per cent equivalent of multiples of 30 *IT* points gained or lost. Another usage would be to curve the *IT* points separately from the test scores. Or perhaps they might be used as markers, to help in deciding borderline grades.

The actual scoring of the *IT*s to produce gains or losses as a result of correct or incorrect answers goes very quickly when the *Standard IT*s are used. A great many of the individual responses are *IT* Zelda and so are simply omissions in the scoring. With a little practice, the remaining *IT*s are quickly handscored on sight as the answers are scored right or wrong.

As a research tool in such areas as decision making, risk taking, or learning, the *IT*s can be used to provide real payoffs or rewards and punishments. Here, too, there are many ways in which the resulting *IT* points can be utilized as criterion measures in research investigations.

In our research we are using a series of criterion measures. We are using the gains and losses to produce two outcome measures: (*a*) an arithmetic sum of the gains and losses—that is, the net gain or loss or the magnitude of the difference between the two; and (*b*) an absolute sum of the gains and losses, without regard to the sign of the gain (+) or loss (—)—that is, a measure of magnitude of all outcomes regardless of gain or loss. The absolute sum, however, does weight the losses more heavily than the gains, since the deterrent values are greater than the incentive values in four of the five *IT*s in which a loss or a gain is possible.

We are using the risks and rewards to produce several criterion measures. These criterion measures are computed from the *IT*s for the correct answers, for the incorrect answers, and as a difference between the two types of answers (correct *vs.* incorrect). They are computed as an average score to the base 12: that is, per 12 correct answers or per 12 incorrect answers. This procedure is exactly equivalent in its meaning to an average score per correct or incorrect item. It does, however, provide an immediate, "intuitive" equivalence to our standard test unit of 12 items while, incidentally, permitting us to dispense with most of the decimal units that would be required with an average per item.

An average risk and an average reward is computed for each type of answer, providing a measure of absolute magnitude of risk-taking behavior measured in terms of potential loss and potential gain. Parenthetically, the average reward measure is equivalent to an average rank of the *IT*s, since the incentive value changes in ordered increments of *one* from *IT* Zelda to *IT* Abigail. The difference scores (of average risk and average reward) between the two types of answers provide an indication of judgment or—what we think is more descriptive—*risk-taking cognition.*

The ratio of risk-to-reward, called the *R/R ratio,* is also computed for each type of answer. It is not a measure of absolute magnitude as are those frequent; and a score of two corresponds to a purely chance level of response, or a score of zero on an open-ended test.

The *IT*s can be adapted to a variety of contexts. For example, they can be abbreviated into a coarse, but acceptable, scale by utilizing only *IT*s Abigail, Carol, Eloise, and Gwendolyn. They can be utilized with a true-false examination, maintaining the same linear nullification-band characteristics, by utilizing *IT*s Abigail through Eloise. In fact, our preliminary experience indicates that *IT*s Flora and Gwendolyn are applied only rarely so that *IT* Hildegarde is, in effect, a null choice. We have, therefore, adopted as our *Standard IT*s a set of six, *IT*s Abigail, Belinda, Carol, Daphne, Eloise, and Zelda, where *IT* Zelda is a null choice of zero incentive value and zero deterrent value.

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The implication and utilization of the *IT* points is a variable that is at the service of the instructor or the investigator. In the classroom teaching situation, they can be used as an additional source of feedback for the instructor or the students, or they can be utilized in a variety of ways to adjust class grades either with or without the traditional "curve." For example, in one class, the authors defined the value of the *IT* points for the students as "30 *IT* points equal 5 per cent for the term's quiz grades." In this usage, there is a complete carryover of *IT* points over all quizzes during the course of the term. The quizzes are scored, either by traditional scoring procedures or by use of the Test-Taking Strategies described below, and then the final quiz grade is modified upward or downward by the appropriate per cent equivalent of multiples of 30 *IT* points gained or lost. Another usage would be to curve the *IT* points separately from the test scores. Or perhaps they might be used as markers, to help in deciding borderline grades.

The actual scoring of the *IT*s to produce gains or losses as a result of correct or incorrect answers goes very quickly when the *Standard IT*s are used. A great many of the individual responses are *IT* Zelda and so are simply omissions in the scoring. With a little practice, the remaining *IT*s are quickly handscored on sight as the answers are scored right or wrong.

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We are using the risks and rewards to produce several criterion measures. These criterion measures are computed from the *IT*s for the correct answers, for the incorrect answers, and as a difference between the two types of answers (correct *vs.* incorrect). They are computed as an average score to the base 12: that is, per 12 correct answers or per 12 incorrect answers. This procedure is exactly equivalent in its meaning to an average score per correct or incorrect item. It does, however, provide an immediate, "intuitive" equivalence to our standard test unit of 12 items while, incidentally, permitting us to dispense with most of the decimal units that would be required with an average per item.

An average risk and an average reward is computed for each type of answer, providing a measure of absolute magnitude of risk-taking behavior measured in terms of potential loss and potential gain. Parenthetically, the average reward measure is equivalent to an average rank of the *IT*s, since the incentive value changes in ordered increments of *one* from *IT* Zelda to *IT* Abigail. The difference scores (of average risk and average reward) between the two types of answers provide an indication of judgment or—what we think is more descriptive—*risk-taking cognition.*

The ratio of risk-to-reward, called the *R/R ratio,* is also computed for each type of answer. It is not a measure of absolute magnitude as are those described immediately above. Rather, the R/R ratio provides a ratio or relative index of risk to reward, or potential loss to potential gain, and only for those instances where a reward is sought. The choice of *IT* Zelda does not affect the R/R ratio. The difference score (of the R/R ratio) between the two types of answers provides an indication of risk-taking cognition.

D. TEST-TAKING STRATEGIES

The *IT* selections are made in a context of maximum information and maximum direct personal control over the outcome. There is maximum information, since all of the elements but one—the "keyed" answer—are directly in view at the time the decision to select an *IT* is made. The degree of direct personal control is maximized, since the *IT* selections are available with complete freedom for each question separately.

The Test-Taking Strategies (*TT*s) are presented for selection before the test is available for inspection and the choice of a *TT* is made for the outcome of the test as a whole. As a result the *TT* selection, as compared to the *IT* selections, is made in a context of less (or moderate) information and less (or moderate) direct personal control over the outcome. (A context of minimum information and minimum direct personal control would be a game of chance or a gambling game, as described by Cutter and Heilizer—in preparation.)

The *TT*s provide an opportunity to select a grading system from a choice of eight grading systems. The *TT*s vary in the ease with which a desirable grade is available, compensated by the risk entailed if the higher grade is not attained, and in the more complete certainty of a moderately acceptable grade, compensated by the reduced likelihood of a more desirable grade. The choice of a *TT* is made before the examination is distributed, with knowledge only of the area to be covered, one's own readiness or mastery of the material, and the general structure of the examination questions. It involves, the authors expect, an implicit comparison of desired performance with expected performance and may, therefore, be similar to measures of level of aspiration.

A description of the *TT*s is contained in Figure 3. The lefthand column indicates the number of correct answers out of 12. Six-choice, multiple-choice questions were used on these examinations so that a score of two correct out of 12 is to be expected as an average chance result. Therefore, the effective range of scores is from two to 12, with a score of two equivalent to a per cent score of zero, a score of three equivalent to 10 per cent, and so on, as indicated in the parenthesized column. These per cent equivalents were used as the initial guides for the development of the *TT*s described in the rest of the figure. The data contained in the body of the figure are called *TT per cent scores*. They represent the outcome of each raw score-*TT* combination or the effect of having selected a *TT* and having obtained a particular raw score.

Of the eight *TT*s, *TT* Alpha provides the greatest opportunity to achieve a grade of "A," or a *TT* per cent score of 95 per cent, and entails the greatest risk of receiving a grade of "E," or a *TT* per cent score of less than 60 per cent. Each progression of one *TT* to the right makes it one raw score more difficult to obtain an "A" of 95 per cent (or a "B" of 85 per cent) and one raw score more difficult—or less likely—to obtain an "E" of less than 60 per cent (or a "D" of 65 per cent). A progression all the way to the right, to *TT* Hotel, yields a conversion scale in which a "C" of 75 per cent is the most likely outcome and in which it is difficult or impossible to obtain different outcomes. The lines in the body of the figure under the *TT*s are simply markers to indicate the points of separation between adjacent grades and the progression of these separations with the progression in *TT*s.

Test-Taking Strategies (TTs)

Raw Score Number Correct (and Per Cent Equivalent)	Alpha	Bravo	Charlie	Delta	Echo	Foxtrot	Golf	Hotel
12 (100%)	95%	95%	95%	95%	95%	95%	85%	85%
11 (90%)	95%	95%	95%	95%	85%	85%	85%	75%
10 (80%)	95%	95%	85%	85%	85%	75%	75%	75%
9 (70%)	95%	85%	85%	75%	75%	75%	75%	75%
8 (60%)	75%	75%	75%	75%	75%	75%	75%	75%
7 (50%)	50%	65%	65%	75%	75%	75%	75%	75%
6 (40%)	50%	50%	65%	65%	65%	75%	75%	75%
5 (30%)	40%	40%	40%	40%	65%	65%	65%	75%
4 (20%)	30%	30%	30%	30%	30%	30%	65%	65%
3 (10%)	20%	20%	20%	20%	20%	20%	20%	20%
2 (0%)	10%	10%	10%	10%	10%	10%	10%	10%
1 (0%)	0%	0%	0%	0%	0%	0%	0%	0%
0 (0%)	0%	0%	0%	0%	0%	0%	0%	0%

FIGURE 3

TEST-TAKING STRATEGIES (*TT*s): *TT* PER CENT VALUES IN RELATION TO RAW SCORE NUMBER CORRECT

The *TT*s can be readily adapted for various contexts, as were the *IT*s. For example, the authors have also used an abbreviated version of the *TT*s with a six-item test. The abbreviated version is described in Figure 4.

A major weakness of the *TT*s of Figure 3 (and the abbreviated version of Figure 4) is that there is a great emphasis on the grades "A," "C," and "E" with a consequent de-emphasis on the grades "B" and "D." A revision of the *TT*s that provides a more equal emphasis on all grades is presented in Figure 5. The *TT* per cent scores in the body of the figure have been rounded to the tens—e.g., 90 per cent, 80 per cent, 70 per cent, and 60 per cent—for ease of scoring and in order to render the choice of a "safe" grade of "C" somewhat less rewarding. The revised set of *TT*s appears to be a great improvement over the original set, both in terms of a simplicity of appearance and a more balanced emphasis on the several grades.

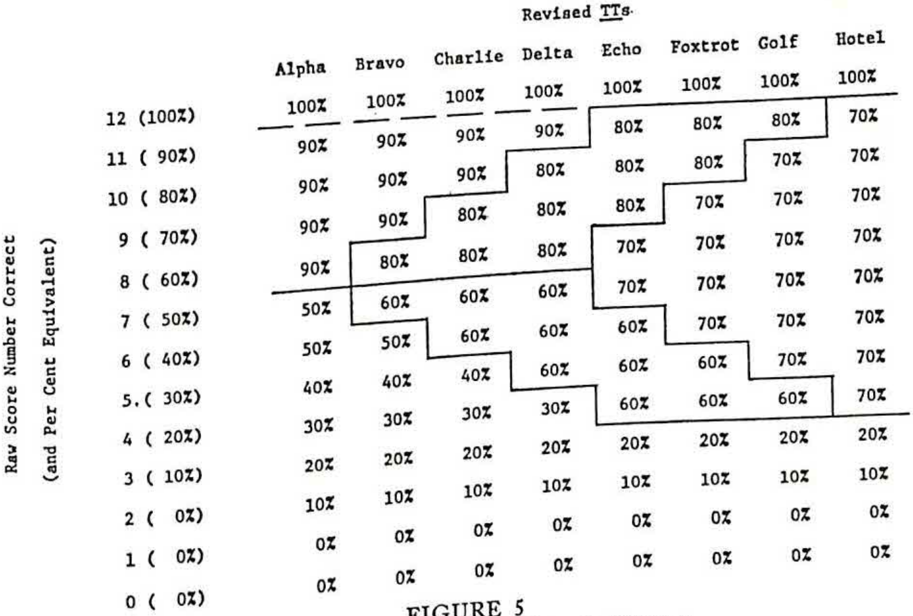
	Abbreviated TTs			
Raw Score Number Correct (and Per Cent Equivalent)	Bravo	Delta	Foxtrot	Hotel
6 (100%)	95%	95%	95%	85%
5 (80%)	95%	85%	75%	75%
4 (60%)	75%	75%	75%	75%
3 (40%)	50%	65%	75%	75%
2 (20%)	30%	30%	30%	65%
1 (0%)	10%	10%	10%	10%
0 (0%)	0%	0%	0%	0%

FIGURE 4
TEST-TAKING STRATEGIES: ABBREVIATED VERSION

We are using three kinds of *TT* criterion measures in our research. The simplest measure is the rank of the *TT*, with *TT* Hotel receiving a rank of one, reflecting the lowest level of aspiration or risk-taking behavior, and *TT* Alpha receiving a rank of eight, reflecting the highest level of aspiration or risk-taking behavior. The rank measure is equally usable with the original and the revised *TT*s.

A second measure of *TT* behavior is to utilize arbitrary scoring bands, somewhat similar to confidence or fiducial limits, which provide an evaluation of the appropriateness of the *TT* in relation to the raw score outcome. The *band measure* is summarized in Figure 6. The linear band of zero values, declining along a diagonal of *TT*s and raw scores, indicates an optimum fit between prior expectation or aspiration and test outcome. In other words, the zero score indicates a zero deviation from an optimum judgment-outcome combination.

As the diagonal bands change in increments or decrements of single units, they indicate increasing departures from the optimum. The negative values, from —1 to —4, indicate increasing underestimates of expected outcome; the positive values, from +1 to +4, indicate increasing overestimates of expected outcome.



Revised TTs.

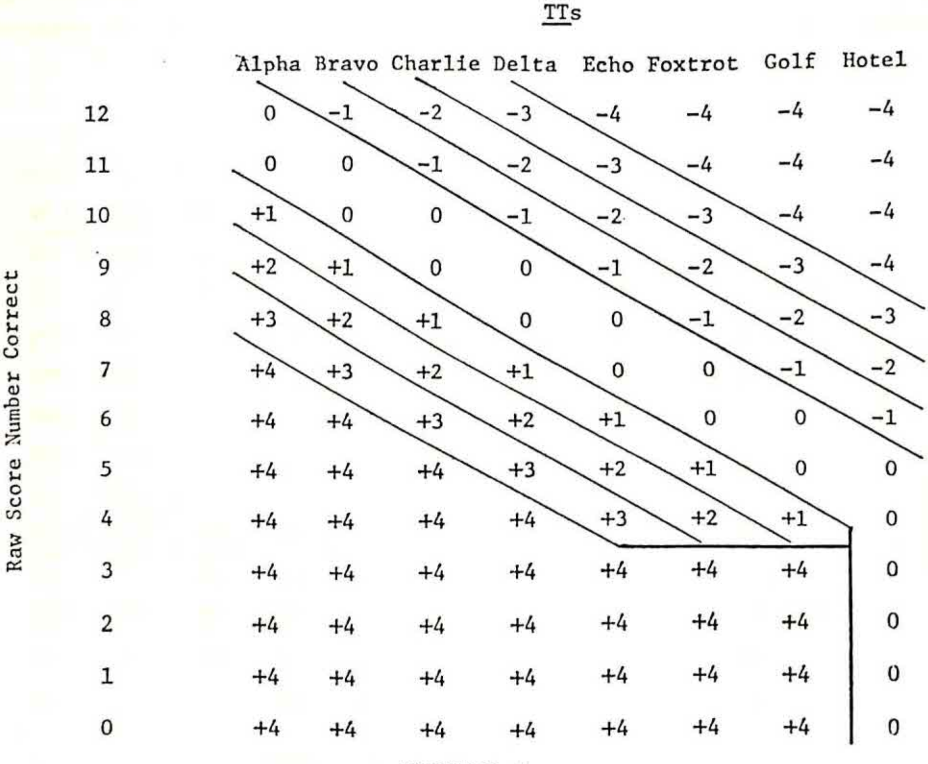
Raw Score Number Correct (and Per Cent Equivalent)	Alpha	Bravo	Charlie	Delta	Echo	Foxtrot	Golf	Hotel
12 (100%)	100%	100%	100%	100%	100%	100%	100%	100%
11 (90%)	90%	90%	90%	90%	80%	80%	80%	70%
10 (80%)	90%	90%	90%	80%	80%	80%	70%	70%
9 (70%)	90%	90%	80%	80%	80%	70%	70%	70%
8 (60%)	90%	80%	80%	80%	70%	70%	70%	70%
7 (50%)	50%	60%	60%	60%	70%	70%	70%	70%
6 (40%)	50%	50%	60%	60%	60%	70%	70%	70%
5.(30%)	40%	40%	40%	60%	60%	60%	70%	70%
4 (20%)	30%	30%	30%	30%	60%	60%	60%	70%
3 (10%)	20%	20%	20%	20%	20%	20%	20%	20%
2 (0%)	10%	10%	10%	10%	10%	10%	10%	10%
1 (0%)	0%	0%	0%	0%	0%	0%	0%	0%
0 (0%)	0%	0%	0%	0%	0%	0%	0%	0%

FIGURE 5
TEST-TAKING STRATEGIES: REVISED VERSION

The resulting values can be averaged over a series of examinations to provide two different criterion measures. An average value of the absolute—unsigned—deviations summarizes an average, variable, deviation from the optimum. An average value of the arithmetic—signed—deviations summarizes an average, biased, deviation from the optimum. An average of the absolute values is analogous to the concept of a variable error, whereas an average of the arithmetic values is analogous to the concept of a constant error.

The band measure is equally applicable to the original *TT*s and the revised *TT*s. We have arbitrarily deviated from a simple across-the-board application of the band measure by limiting the values to the range of ±4, and by scoring the raw score outcomes of three, two, one, and zero as a band measure of zero when *TT* Hotel has been selected and as a band measure of *+4* when a *TT* other than *TT* Hotel has been selected.

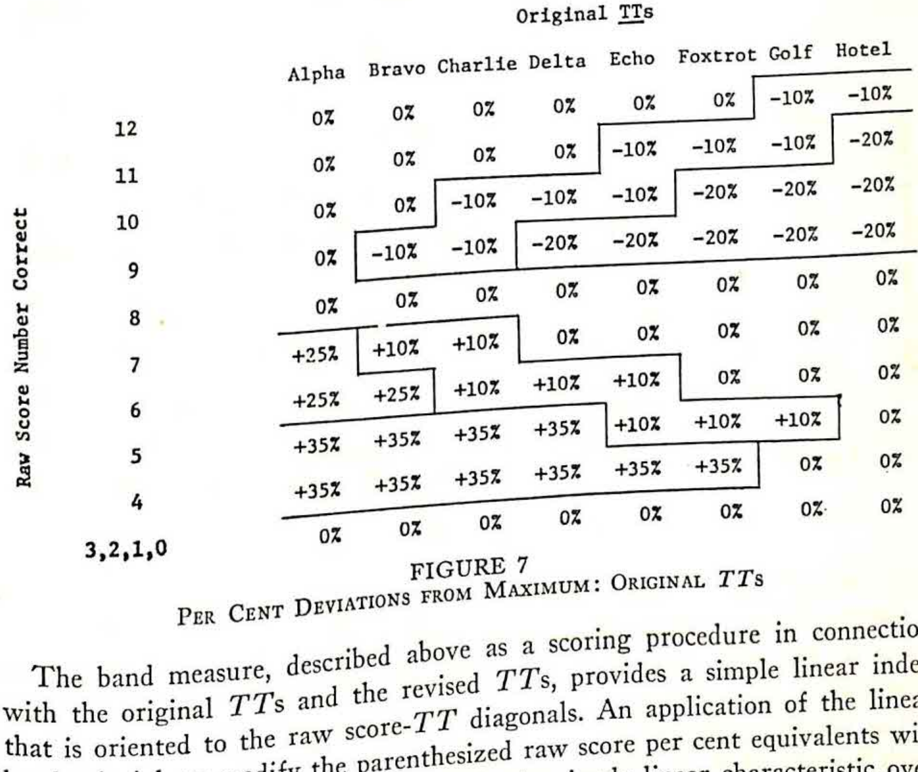
A third measure of *TT* behavior is to evaluate the resulting *TT* per cent score in relation to the maximum *TT* per cent score that could have been



	TTs							
Raw Score Number Correct	Alpha	Bravo	Charlie	Delta	Echo	Foxtrot	Golf	Hotel
12	0	-1	-2	-3	-4	-4	-4	-4
11	0	0	-1	-2	-3	-4	-4	-4
10	+1	0	0	-1	-2	-3	-4	-4
9	+2	+1	0	0	-1	-2	-3	-4
8	+3	+2	+1	0	0	-1	-2	-3
7	+4	+3	+2	+1	0	0	-1	-2
6	+4	+4	+3	+2	+1	0	0	-1
5	+4	+4	+4	+3	+2	+1	0	0
4	+4	+4	+4	+4	+3	+2	+1	0
3	+4	+4	+4	+4	+4	+4	+4	0
2	+4	+4	+4	+4	+4	+4	+4	0
1	+4	+4	+4	+4	+4	+4	+4	0
0	+4	+4	+4	+4	+4	+4	+4	0

FIGURE 6
BAND MEASURE FOR *TT*S: DEVIATIONS FROM OPTIMUM

obtained for the raw score outcome. These *TT* per cent scores, relative to a maximum, are summarized in Figure 7 for the original *TT*s and in Figure 8 for the revised *TT*s. (The minus and plus signs conserve the direction of the deviation, as with the band measure.) The values shown indicate a complex, nonlinear structure underlying both sets of *TT*s, although less so for the revised *TT*s. The use of the ranks and the band measure as indices of *TT* behavior is "intuitively" acceptable and is expected to provide fruitful criterion measures when employed in conjunction with the social and personality data which the authors have collected. However, the analysis of the per cent scores as a deviation from a maximum does indicate that there is an underlying complex, nonlinear structure to both the original *TT*s and the revised *TT*s. This inherent property of the metric renders the entire procedure suspect to unknown biases in actual use, despite what may be—and still is, to the authors—an intuitive appropriateness to each set of *TT*s. The authors have, therefore, devised a third set of *TT*s, which appears to combine the characteristics of a simple linear metric structure with an intuitive appropriateness.



Raw Score Number Correct	Alpha	Bravo	Charlie	Delta	Echo	Foxtrot	Golf	Hotel
12	0%	0%	0%	0%	0%	0%	-10%	-10%
11	0%	0%	0%	0%	-10%	-10%	-10%	-20%
10	0%	0%	-10%	-10%	-10%	-20%	-20%	-20%
9	0%	-10%	-10%	-20%	-20%	-20%	-20%	-20%
8	0%	0%	0%	0%	0%	0%	0%	0%
7	+25%	+10%	+10%	0%	0%	0%	0%	0%
6	+25%	+25%	+10%	+10%	+10%	0%	0%	0%
5	+35%	+35%	+35%	+35%	+10%	+10%	+10%	0%
4	+35%	+35%	+35%	+35%	+35%	+35%	0%	0%
3,2,1,0	0%	0%	0%	0%	0%	0%	0%	0%

Original TTs

FIGURE 7

PER CENT DEVIATIONS FROM MAXIMUM: ORIGINAL *TT*s

The band measure, described above as a scoring procedure in connection with the original *TT*s and the revised *TT*s, provides a simple linear index that is oriented to the raw score-*TT* diagonals. An application of the linear band principle to modify the parenthesized raw score per cent equivalents will produce *TT* per cent scores that contain the simple linear characteristic over the set of eight *TT*s. The principle is summarized in Figure 9 and the resulting *TT* per cent scores for the *linear-band* *TT*s are contained in Figure 10.

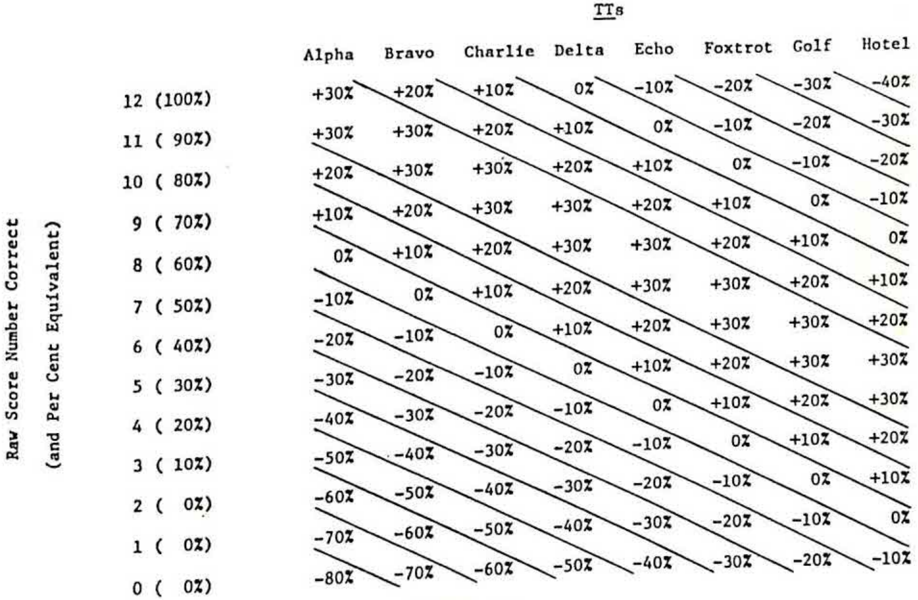
The data of Figure 9 indicate that varying per cents are added to, or subtracted from, the per cent equivalents of the raw scores as a function of the *TT*-raw score, or judgment-outcome, combination. A value of 30 per cent is added to the per cent equivalent for an optimum (i.e., zero value) band measure combination. The addition of the 30 per cent produces a maximum

TT per cent score for a particular raw score, with the maximum *TT* scores always determined by the optimum band measure diagonal. As the diagonal bands change in increments or decrements of single units, the value added is successively reduced by magnitudes of 10 per cent. The *TT* per cent score is eventually reduced to its original value of the raw score per cent equivalent when the value added is zero per cent, and thereafter the *TT* per cent score is successively reduced by magnitudes of 10 per cent below the value of the raw-score per cent equivalent. The result of this procedure is presented in Figure 10.

	Revised TTs							
Raw Score Number Correct	Alpha	Bravo	Charlie	Delta	Echo	Foxtrot	Golf	Hotel
12	0%	0%	0%	0%	0%	0%	0%	0%
11	0%	0%	0%	0%	-10%	-10%	-10%	-20%
10	0%	0%	0%	-10%	-10%	-10%	-20%	-20%
9	0%	0%	-10%	-10%	-10%	-20%	-20%	-20%
8	0%	-10%	-10%	-10%	-20%	-20%	-20%	-20%
7	+20%	+10%	+10%	+10%	0%	0%	0%	0%
6	+20%	+20%	+10%	+10%	+10%	0%	0%	0%
5	+30%	+30%	+30%	+10%	+10%	+10%	0%	0%
4	+40%	+40%	+40%	+40%	+10%	+10%	+10%	0%
3,2,1,0	0%	0%	0%	0%	0%	0%	0%	0%

FIGURE 8
PER CENT DEVIATIONS FROM MAXIMUM: REVISED *TT*s

The advantages of the linear metric are immediately apparent. There is a much greater range of *TT* per cent scores than for either the original *TT*s or the revised *TT*s: the range varies from 30 per cent to 70 per cent at any given level of raw score outcome as compared to zero per cent to 35 per cent for the original *TT*s and zero per cent to 40 per cent for the revised *TT*s. The *TT* per cent scores at, or near, the extremes of —80 per cent and 130 per cent are somewhat extreme. However, they will rarely occur. When they do occur, they might be directly averaged with the scores of other tests, or they might be compensated by such devices as providing credit against other work (e.g., for a *TT* score of 130 per cent) or by requiring additional work (e.g., for a TT score of —80 per cent). Each TT provides its own maximum TT per cent score. There is a linear band of optimal judgment-outcome combinations along the central diagonal of TT-raw score combinations. And there is a gradual increase in TT per cent scores for each TT as the raw scores increase towards the optimum raw score-TT combination. Application of a band measure to evaluate performance on the linear-band TTs yields a scoring index that is exactly equivalent to the use of TT per cent scores in relation to a maximum for any given raw score. (There is, in fact, a slight nonlinearity in TT per cent scores for the raw scores of zero and one. The nonlinearity occurs because the per cent equivalent of the raw scores has not been reduced below zero. However, it is a minor consideration and easily ignored or easily corrected.)



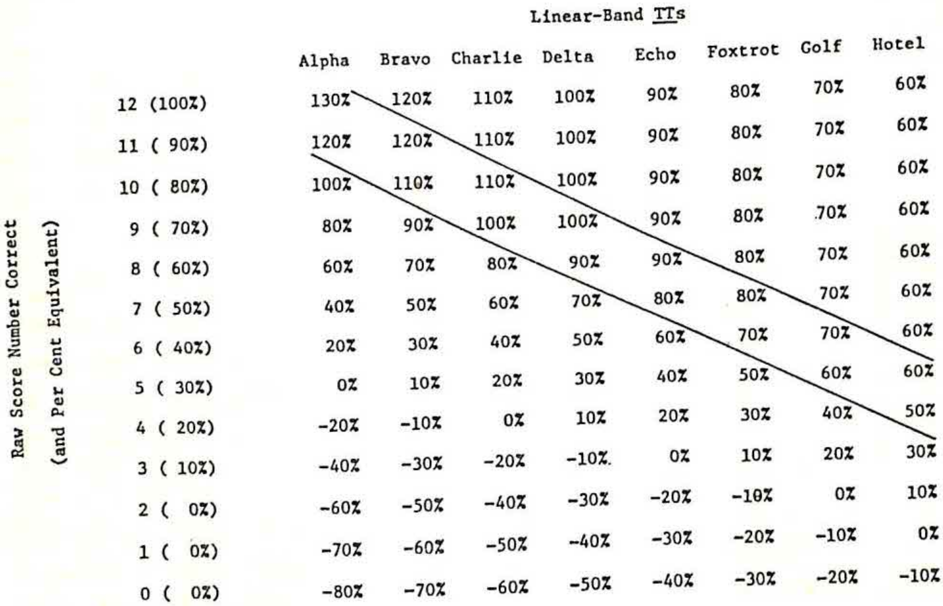
Raw Score Number Correct (and Per Cent Equivalent)	Alpha	Bravo	Charlie	Delta	Echo	Foxtrot	Golf	Hotel
12 (100%)	+30%	+20%	+10%	0%	-10%	-20%	-30%	-40%
11 (90%)	+30%	+30%	+20%	+10%	0%	-10%	-20%	-30%
10 (80%)	+20%	+30%	+30%	+20%	+10%	0%	-10%	-20%
9 (70%)	+10%	+20%	+30%	+30%	+20%	+10%	0%	-10%
8 (60%)	0%	+10%	+20%	+30%	+30%	+20%	+10%	0%
7 (50%)	-10%	0%	+10%	+20%	+30%	+30%	+20%	+10%
6 (40%)	-20%	-10%	0%	+10%	+20%	+30%	+30%	+20%
5 (30%)	-30%	-20%	-10%	0%	+10%	+20%	+30%	+30%
4 (20%)	-40%	-30%	-20%	-10%	0%	+10%	+20%	+30%
3 (10%)	-50%	-40%	-30%	-20%	-10%	0%	+10%	+20%
2 (0%)	-60%	-50%	-40%	-30%	-20%	-10%	0%	+10%
1 (0%)	-70%	-60%	-50%	-40%	-30%	-20%	-10%	0%
0 (0%)	-80%	-70%	-60%	-50%	-40%	-30%	-20%	-10%

FIGURE 9
BAND MEASURE ADJUSTMENTS FOR THE TTs

E. SOME AUXILIARY COMMENTS

The authors have encountered several problems of importance during the course of their initial explorations with the above methodologies in the classroom situation. They will comment briefly on the substance of these problems for the information of the reader who might be planning to do work along similar lines or in similar settings.

The most specific and immediately serious problem the authors encountered was the failure of their attempts to automate the entire procedure of taking the examinations: selecting the *TT*, answering the questions, and weighting the answers with the desired *IT*s. A special mark-sense card format was developed for these procedures so that the students could quickly and easily complete all the required steps. In addition, a computer program was developed for the IBM 620, which provided for record-keeping and summary statistics for individuals and classes. However, the requirements of the mark-sensing procedure, such as proper erasures, no extraneous pencil marks, darkened marks, identifying data (numbers assigned as student identification) in pen, proved to be too great a burden for too many students. There was a great deal of confusion engendered by the total complex of the mark-sensing procedures in addition to the taking of examinations with *TT*s and *IT*s. We do not know if the students would have eventually developed a mastery of the procedures, for it quickly became apparent that this attempt at automation was introducing confusion and errors on a grand scale.



	Linear-Band TTs							
Raw Score Number Correct (and Per Cent Equivalent)	Alpha	Bravo	Charlie	Delta	Echo	Foxtrot	Golf	Hotel
12 (100%)	130%	120%	110%	100%	90%	80%	70%	60%
11 (90%)	120%	120%	110%	100%	90%	80%	70%	60%
10 (80%)	100%	110%	110%	100%	90%	80%	70%	60%
9 (70%)	80%	90%	100%	100%	90%	80%	70%	60%
8 (60%)	60%	70%	80%	90%	90%	80%	70%	60%
7 (50%)	40%	50%	60%	70%	80%	80%	70%	60%
6 (40%)	20%	30%	40%	50%	60%	70%	70%	60%
5 (30%)	0%	10%	20%	30%	40%	50%	60%	60%
4 (20%)	-20%	-10%	0%	10%	20%	30%	40%	50%
3 (10%)	-40%	-30%	-20%	-10%.	0%	10%	20%	30%
2 (0%)	-60%	-50%	-40%	-30%	-20%	-10%	0%	10%
1 (0%)	-70%	-60%	-50%	-40%	-30%	-20%	-10%	0%
0 (0%)	-80%	-70%	-60%	-50%	-40%	-30%	-20%	-10%

FIGURE 10
TEST-TAKING STRATEGIES: LINEAR-BAND VERSION

Upon discarding the mark-sense cards (and computer program), the authors utilized shorter quizzes, the abbreviated *TT*s, and developed the standard *IT*s.

They found that, with practice, the procedure could be presented simply to the students and quickly scored by the instructor, so that the authors were able to return to a larger test, using a full set of *TT*s—the revised *TT*s—and retaining the standard *IT*s.

The second problem is more profound and ultimately of much more importance. It has to do with the conduct of continuing research on cognition and risk taking in the naturalistic setting that is the classroom. The classroom offers the immense advantage of a real and relevant ecology that is not present and not readily developed in the laboratory. On the other hand, the disadvantages of the naturalistic setting that is the classroom are also real and relevant. The essence of these disadvantages, expressed in a variety of forms, is the lack of experimental control and its concomitant restriction upon inference. For example, crude adjustments must be made for students who register late or for examinations that are missed. (In our particular situation there was a shortage of textbooks during the first month of the course.) More basically, there is an uncontrolled heterogeneity in the course content, which provides the raw material for the examinations. An examination on statistics, for example, is quite different from an examination that covers personality. And it may turn out that the heterogeneous contents of courses of instruction may be crucial variables in this or related research. Conclusions relevant to this conjecture, however, are best obtained in the rigorous control of the laboratory setting. It would be possible, for example, to utilize teaching machine programs to provide courses of instruction that are specially oriented towards various content areas or specially defined aptitudes, and which can specify such variables as level of difficulty, degree of homogeneity or heterogeneity, completeness of information, bits of information available, similarity of bits of information, and amount of contact in relation to the combination of judgment and guessing that is called risk taking or decision making.

A third problem of more subtlety but of no less importance involves the dual roles that are required in this naturalistic setting. The instructor is also the investigator and the students are also the subjects. Students may volunteer as subjects when the procedures of research are clearly external to the purposes of instruction, as when social and personality data are sought. However, when the procedures of research are inextricably interwoven with the purposes of instruction, the students do not have the luxury of volunteering for the research; they are, by definition, a part of the research regardless of the intention to participate. It was, therefore, a matter of some delicate urgency to provide options that are either neutral, as with *IT* Zelda and *IT* Hildegarde, or a wide variety of options, as with eight *TT*s, so as not to coerce the students-subjects into choices that are dictated by research requirements. The authors feel that the methodologies described above do meet these dual requirements and are completely acceptable to the students as instructional devices.

There are a few relatively minor points, however, with which the authors (but not the students) had some difficulty. At the beginning of the term, before the authors had actually put the original *IT*s and *TT*s into practice, they had not completely worked through the problem of dual roles. For example, they were somewhat obsessive in indicating that *TT* Bravo could be considered to be the routine scoring system for the examinations. This, of course, immediately biased the class towards the use of *TT* Bravo. Although the initial bias did not appear to last very long, it would be well for an instructor-investigator to distinguish clearly for himself the mutual boundaries and responsibilities of the two roles before the classroom situation is structured. Another type of problem that arises from time to time is the credit that might be given for a poorly worded question or for a question with two or more acceptable answers. The problem does not appear to arise very often, but when it did the authors followed the practice of making an instructional judgment completely separately from the research judgment. Therefore, a "bad" question *might* be scored one way in terms of the *TT* and *IT* implications for grading purposes while scoring it differently in terms of recording research data.

F. SUMMARY

This article is primarily a description of two new methodologies that are being used to investigate cognition and risk taking in a classroom situation: Item-Taking Strategies (*IT*s) and Test-Taking Strategies (*TT*s).

The *IT*s are used to weight responses to objective test items while controlling for the potential effects of overall test achievement. A selection is made for each test item separately as the subject answers the question. Therefore the selections are made in a context of maximum information and maximum direct personal control over the outcome, with only the "keyed" answer being lacking.

The *Standard IT*s consists of six choices, as follows with their corresponding incentive and deterrent values: Abigail (+5, —25), Belinda (+4, —12), Carol (+3, —6), Daphne (+2, —3), Eloise (+1, —1), Zelda (0, 0). A correct answer converts the incentive value of the *IT* selection to a gain of *IT* points; an incorrect answer converts the deterrent value of the *IT* selection to a loss of *IT* points. The *IT* points gained or lost have an arbitrary conversion value into grade points for the course that is overtly defined for the subjects at the beginning of the term.

The *TT*s are used to weight the overall test outcome, balancing high achievement against high risk and low achievement against low risk. A selection is made for the test as a whole before the test is available to the subject. Therefore the *TT* selections, similar to level of aspiration judgments, are made in a context of only moderate information and moderate direct personal control over the outcome.

Several sets of *TT*s have been utilized. Each set converts the usual distribution of per cent scores—equal step increments from zero per cent to 100 per cent—into a series of per cent scores with selected emphasis on limited sections of the per cent distribution. The selection that most clearly balances high achievement against high risk (*TT* Alpha) emphasizes the "A" and "E" parts of the per cent distribution. There is a continual change in emphasis as the *TT*s progress towards the clearest balance of low achievement against low risk (*TT* Hotel), at which point the "C" part of the per cent distribution is almost exclusively emphasized.

The scoring procedures that have been used with the *TT*s indicate that all the sets that have been used so far are not adequately constructed with respect to linearity of the metric and simplicity of interpretation. A new set was constructed and described that does meet the requirements of linearity and simplicity.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 47-58.

STRATEGIES OF HYPNOTIC INTERROGATION*

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A. INTRODUCTION

One of the most fascinating questions in research on hypnosis is whether a hypnotized subject can be induced to reveal information that he wishes to conceal. A more precise formulation would be to ask what conditions increase the probability of detection of concealed information during hypnosis. Are some techniques of interrogation—and some strategies of concealment—more effective than others? How effectively can a hypnotized subject withhold information from an interrogator? Are the most hypnotizable individuals especially likely to reveal information?

We know that under some circumstances hypnotic interrogation can elicit information. For example, ideomotor questioning methods in hypnotherapy (5) have sometimes located information of clinical value. In these methods, the hypnotized patient may be told that a movement of his right hand or a finger will mean "yes," and a movement of his left hand or another finger will mean "no"; he is then asked questions to which he may not consciously know the answer. Watkins (11) has used hypnotic interrogation as a means of overcoming conscious resistance to revealing information. He reported demonstrations in which he successfully obtained information from military personnel who had been directly ordered by a superior officer not to reveal it. Although these results indicate that under some conditions hypnotic interrogation is successful, Watkins did not attempt to specify which conditions favored successful interrogation and which conditions prevented it. Since he worked only with excellent hypnotic subjects, he implied that hypnotizability was correlated with responsiveness to hypnotic interrogation. However, it remains an open question what results would have been obtained with less highly selected subjects.

Orne (7) has reviewed some of the problems confronting anyone who

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* Received in the Editorial Office, Provincetown, Massachusetts, on May 29, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] NIH Special Postdoctoral Fellow, New York University. The authors thank Professor Morton Deutsch, Columbia University, for suggestions and for support under ONR Contract No. Nonr-4294 (00).

attempted to use hypnosis to interrogate enemy prisoners of war. His discussion is based on an extrapolation from the current state of knowledge in clinical and experimental hypnosis, inasmuch as there is "an utter dearth of literature concerning the actual use of hypnosis in interrogation." He concluded that the hypnotized subject may lie, withhold information, or confuse fantasy with reality; that studies indicating that hypnosis may induce antisocial behavior are open to the criticism that the laboratory is a pseudoreality situation in which subjects feel protected no matter what they are asked to do; and that the hypnotic induction of antisocial acts (including revealing of confidential information) appears to depend upon a pre-existing positive relationship between subject and hypnotist.

Interrogation under hypnosis has certain points in common with interrogation under drugs. In both cases there may occur alterations in consciousness, apparent weakening of self-control, and occasional revelation of information in spite of a continued wish to keep it secret. Redlich, Ravitz, and Dession (9) instructed nine subjects to conceal items of information during interviews conducted under sodium amytal. The subjects invented a "cover story" to help conceal the shame- or guilt-producing incidents. The authors found that three subjects maintained the cover story, two revealed the true story, two made partial admissions, one admitted a probable fantasy as the truth, and one maintained the cover story except for a slip of the tongue. Clark and Beecher (1) used large amounts of hypnotic, narcotic, analeptic, and hallucinogenic drugs to break down a cover story and detect concealed information. In spite of the fact that their subjects seemed at different times semicomatose, euphoric, mildly delirious, loquacious, panicky, etc., only two of 20 students betrayed the cover story by slips of the tongue. The results of these studies indicate that, although interrogation under drugs can sometimes be effective, there are many exceptions. These studies do not tell us what techniques were most successful, nor do they indicate what strategies of concealment were used by the subjects.

Interest in hypnotic interrogation has been stimulated by its potential usefulness in police work or in legal proceedings. In one recent case (10), a defendant in a murder trial was hypnotized in a courtroom setting and questioned by a psychiatrist, by his own attorney, and by the prosecutor. Such cases raise many questions concerning the accuracy of information elicited under hypnotic interrogation. Such cases also suggest that the difficulty of hypnotizing a person against his will may not be a conclusive objection to the practical use of hypnotic interrogation. The subject may freely consent to hypnosis in the hope of proving his innocence or mitigating his guilt.

The purpose of the present study was to create a laboratory analogue of hypnotic interrogation, and to use it to study the interplay of forces in this situation. In our research, one experimenter instructed the subject to allow himself to be hypnotized by a second experimenter, but to conceal an item of information (a number) from him. The second experimenter then capitalized upon the hypnotic state to try to induce the subject to reveal the number. These instructions were designed to create a conflict between the hypnotic impulse to reveal the information and the conscious motive to conceal the information. The authors wished to find how easy or difficult it was for unselected subjects to conceal information under these conditions, to find the detection strategies that were most effective, and to find what strategies of concealment were spontaneously adopted by the subject.

B. METHOD AND PROCEDURE

1. *Subjects, Instructions, and Tests*

Subjects were 35 paid volunteer college students and recent graduates recruited through notices on college bulletin boards. They ranged in age between 18 and 28. No subject had previously participated in hypnosis research. Each subject was tested individually in a hospital psychology-research laboratory. Of these 35 subjects, 26 were assigned to an experimental group and nine to a control group. The control subjects were treated identically to experimental subjects except that they merely read the interrogation techniques and the preinterrogation hypnotic induction, and were instructed to guess how they would have responded if they had actually undergone the interrogation. A control group of this kind was suggested by Orne's (8) discussion of methods to control the demand characteristics of the psychological experiment. In order to determine whether subjects are responding to a real variable or just to their hypotheses about the experiment, it is necessary to obtain some estimate of what subjects think they are to do or what they think will happen. One way to obtain this estimate is to instruct some subjects to read a description of the experiment, and then try to judge what the experiment is all about or how they would have responded.

Three interrogation techniques were developed through pretests, during which the authors discarded techniques that depended on specialized hypnotic ability—such as the ability to have hallucinations—in order to obtain techniques that are applicable to many subjects. One technique was based on one of Watkins' interrogation methods. In this technique the subject is instructed to imagine the number at the back of his mouth, imagine its moving forward, and finally speak the number. The second technique centered around the implantation of guilt and the reduction of it through revealing the number. The third technique was based on lie-detection methodology: the subject is instructed to make an involuntary movement when he hears the number read aloud.

Each subject was given the Stanford Hypnotic Susceptibility Scale, Form A (12), and an inventory measure of subjective hypnotic depth (3). After these tests the following instructions were given:

> I am going to let you pick a card with a number on it. This number will be somewhere between zero and nine. You are to remember this number very carefully. Now take one of these cards. Now write down the number you have selected. After we are through here Dr. ——— will try to find out which number you have selected. You will try as hard as you can to avoid telling him the number. Dr. ——— will hypnotize you to find out what the number is, and you will enter hypnosis. What I want you to do is to try to conceal the information from Dr. ———. When he asks you what number you saw, you will not tell him. When he asks you to go into hypnosis once again, you will of course enter hypnosis. Even though you are deeply hypnotized, you will not tell him the number. You have a good chance to do this successfully. If you think that you may have given the number away at some point, keep trying to conceal it, because Dr. ——— may not be aware of whether the number has been revealed. Now write down the number once again. Now do you have any questions?
>
> If the subject asks "Can I tell a lie?" he is told, "That's up to you. Just conceal the number you picked."

The subject was then transferred to the second experimenter in another room. (Random selection determined which of the two experimenters would take the role of the first experimenter or the interrogator with any given subject.) He was then rehypnotized by the Eye Closure induction of the Stanford Hypnotic Susceptibility Scale, Form B (12), and two of the items on this scale were administered (finger lock and arm rigidity). Next the hypnotized subject was asked "What number did you pick?" This question served to establish whether the subject would reveal the information in reply to a simple question, without elaborate interrogation methods. After this, the three interrogation techniques given below were presented to each subject, with the order of administration of the three techniques randomized for each subject. After the interrogation, hypnosis was terminated; and the subject was given a postinterrogation questionnaire, another hypnosis inventory, and an interview. These instruments obtained information on reactions during the experiment and ratings on the difficulty of resisting each interrogation technique.

2. *Interrogation Techniques*

a. Number moving forward.

Now you remember the number you picked very clearly, but everything else about the number is getting hard to remember, very hard to remember. You cannot remember what Dr. ——— told you about the number, you cannot remember what you are supposed to do with the number. And now, is it getting more difficult to remember the instructions Dr. ——— gave you about the number? [*Record reply.*] You seem to be just watching what is happening as if from a distance, watching yourself sitting deeply hypnotized in your chair, remembering only the number and nothing else, and you know that soon your voice and your mouth will start to work automatically and involuntarily and say the number. Now imagine the number at the back of your mouth. Imagine the number written very clearly at the back of your mouth. And you still have trouble remembering anything that Dr. ——— said about this number. Now a little later, you will find that the number begins to travel forward in your mouth. It will begin to move forward in your mouth, and when it gets to your lips you will speak it loudly and clearly. You will feel a powerful wish to reveal the number you picked, and no matter how hard you try to conceal it, you will not be able to conceal it. And now the number is coming forward in your mouth, and soon your mouth will say it out loud. The number is now moving forward, it's now on the tip of your tongue, now at your teeth, your lips—what's the number? [*Record reply.*] All right, that's fine. And now you can remember very clearly what Dr. ——— said, and everything else. There is no number in your mouth, you are no longer watching yourself from a distance, and your mouth is no longer working automatically. Just relax.

b. Guilt.

Now think how much you dislike the instructions Dr. ——— gave you. He told you to conceal a number from me, and you greatly dislike to do this. You even feel angry at Dr. ——— for putting you in this uncomfortable position. And now you can think back to some time in the past when you felt guilty about doing something your conscience told you not to do, such as taking something that did not belong to you, or doing something you should have been punished for. And you remember this feeling of guilt, or shame, because you are feeling it very clearly once again. But now you feel guilty and ashamed about keeping the number secret from me, and that feeling of shame and guilt is getting stronger because I asked you for the number and you tried to keep it a secret from me. And now is your conscience beginning to bother you for not telling me the number? [*Record reply.*] This feeling is getting much stronger, much stronger. You will feel a powerful wish to reveal the number you picked, and no matter how hard you try to conceal it, you will not be able to conceal it. And when you tell me the number, you will feel much better right away. You will feel relieved, greatly relieved, when you tell me the number. What Dr. ——— told you was wrong, completely wrong, and you will feel so much better now when you tell me the number, right now. What's the number? [*Record reply.*] That's fine. You no longer feel guilty or ashamed. All the guilty feeling is going away. You know that you did nothing wrong. You no longer dislike the instructions Dr. ——— gave you, and you do not feel angry at him. Just relax.

c. Lie-detection.

Now soon I will tap my pen on the table, like this (*tap*). When I do, you will make some kind of reaction to it. For example, your face may change expression, or your whole body may move around in your chair, or something else, but in any case you will make some kind of response when I tap my pen on the table. Even if you try to prevent the response, you will make it anyway. When I tap my pen on the table, you will make some kind of response. [*Tap pen loudly, record response.*] All right, now I'm going to say all the numbers between zero and nine, and when I get to the number you picked, you will make an even stronger response to it. When I say the number you picked, you will make some automatic, involuntary response, even stronger than the response you just made, much stronger. Your whole face may change expression, or your body may move around when you hear the number. You will feel a powerful wish to reveal the number you picked, and no matter how hard you try to conceal it, you will not be able to conceal it. And now soon I will start to count, and you will find yourself responding automatically, without thinking. There is no way you can prevent the response. You think only of the number you picked, and you know you will make some noticeable, obvious response when you hear me say it. You will respond only to the number you picked—you will not respond to any other number. And now I will count, and you will respond without thinking.

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 3, 5, 8, 0, 4, 7, 2, 1, 9, 6. [*Record movements, gestures.*] All right, that's fine. Now you will no longer make any special response when you hear the number. You can forget all about making some special response to the number.

C. RESULTS

Six of the 26 subjects (23 per cent) revealed the information during one or more of the interrogations, while 20 subjects successfully concealed it (Table 1). No subject revealed the information in response to the simple question asked by the interrogator just before the three experimental interrogations. A sign test on the six subjects who revealed the information indicates that the experimental interrogations were more effective than a simple question in eliciting information (.05 level).

Table 1 shows that five of the eight instances in which subjects were unable to conceal information occurred during the lie-detection interrogation, whereas only one instance of inability to conceal occurred during the number-moving-forward technique, and only two during the guilt technique. These very small numbers do not by themselves establish one technique as statistically superior to another. However, the initial impression of the possible superior effectiveness of the lie-detection technique is confirmed by attitude rating scales. After termination of hypnosis, each interrogation technique was rated on a six-point scale (from "Very easy to resist" = 1 to "Very hard to resist" = 6). An analysis of variance indicates that the mean ratings for each technique vary significantly (.001 level). Tukey's test for a significant gap indicates that the lie-detection technique was rated significantly more difficult to resist than the number-moving-forward technique (.05 level), and the latter significantly more difficult to resist than the guilt technique (.05 level; means of 4.00, 3.31, and 2.46 respectively).

TABLE 1
EFFECTIVENESS OF DIFFERENT INTERROGATION TECHNIQUES

Subject	Interrogation techniques		
	Number-moving	Guilt	Lie detection
B	Conceal	Reveal	Conceal
L	Conceal	Conceal	Reveal
A	Reveal	Conceal	Reveal
M	Conceal	Conceal	Reveal
W	Conceal	Reveal	Reveal
F	Conceal	Conceal	Reveal
20 additional subjects all showed this pattern:	Conceal	Conceal	Conceal
Total reveal	1	2	5

TABLE 2
NUMBER OF SUBJECTS REVEALING AND CONCEALING INFORMATION IN INTERROGATION AND CONTROL GROUPS

Variable	Experimental hypnotic interrogation	Control guessing own responses
Reveal	6	8
Conceal	20	1

Note: Difference between experimental and control groups significant at .01 level.

Table 2 compares the experimental subjects who actually revealed the information with the control subjects who were instructed to guess how they would have responded if they had actually undergone the interrogation. The two groups did not differ significantly in hypnotizability. A two-tailed Fisher exact probability test indicates that the guessing control group revealed information significantly more often than the experimental interrogation group (.01 level). In other words, subjects expect hypnotic interrogation to be more effective than it actually is.

The six subjects who revealed the information had significantly higher Stanford hypnotizability scores than the 20 subjects who successfully concealed the information (means of 9.33 and 6.30 respectively, $t = 2.39$, 24 *df*, .05 level). However, this relationship between hypnotizability and an increased probability of revealing information was not observed in the guilt technique of interrogation. Both subjects who revealed the information during the guilt interrogation had Stanford hypnotizability scores of 6, while the mean Stanford score for the remaining 24 subjects was 7.08.

The subjective hypnotic depth during the interrogation was assessed through comparing a 38-item inventory of hypnotic experiences obtained after the Stanford Form A with a repetition obtained after the interrogation. The interrogation hypnosis was rated slightly, but significantly, less deep than the Stanford Form A hypnosis (mean difference $= 2.23$, t for correlated means $= 3.42$, 25 *df*, .01 level). Change scores were also examined on individual items. In other words, items checked as "True" during one hypnosis and "False" during the other hypnosis were compared, and use was made of McNemar's (6) chi-square test for the significance of changes, corrected for continuity. This analysis suggests that the interrogation hypnosis was characterized by increased ability to resist. The following two items discriminated the two hypnoses most effectively, both at the .02 level. These items were denied about the interrogation hypnosis and affirmed about the Stanford Form A hypnosis: "I could not have stopped doing the things the experimenter suggested even if I tried," and "I felt uninhibited." In other words, during interrogation the subject feels that he is more able to oppose the experimenter's suggestions, and he also feels more inhibited or less responsive. Another item indicating that subjects felt they could have awakened more easily during the Stanford Form A hypnosis than during the interrogation hypnosis (.05 level) was the only item that significantly reversed this trend toward greater subjective self-control during the interrogation hypnosis.

Five of the 26 subjects attempted not only to withhold the information but also to deceive the interrogator into making a wrong guess about which number was concealed. These five subjects, who did not differ significantly from the remaining subjects in hypnotizability, were all successful in concealing the information. Three subjects attempted to do this by choosing a single incorrect response and giving it during the interrogation. This tactic was generally successful in misleading the interrogator into thinking he had succesfully extracted the concealed number, especially when the subject appeared to be hesitant or compelled to reveal the number. Two subjects gave deceptive bodily movements to several different incorrect numbers during the lie-detection interrogation. Although this tactic was successful in concealing the true number, it revealed the fact that the subject was lying and did not mislead the interrogator into making a wrong guess about which number was concealed.

D. Discussion

The results indicate that two extreme hypotheses are unwarranted: the group tested showed neither uniform ability to resist the hypnotic interrogation nor uniform ability to conceal information. This finding is consistent with Hilgard's (4) report that, in subjects motivated to resist hypnotic suggestions, both the resistance and the suggestions are partially effective. If the present results can be generalized, they suggest that hypnotic interrogation has some effectiveness only with a minority of subjects who are quite easily hypnotized, and is undependable with average or poor hypnotic subjects. This conclusion must be qualified by the fact that we used a relatively brief (15-minute) hypnotic induction, which of course was not effective with all subjects, and which did not produce a uniform level of hypnosis in everyone. Other possible factors that might qualify this finding include the lack of hypnotic pretraining of subjects and the absence of polygraphic instrumentation. Moreover, in police interrogation, subjects may be more highly motivated to resist (although more uncertain about exactly what must be concealed); subtle probing under hypnosis rather than blatant interrogation may be employed; and subjects may fake hypnosis or may fake hypnotic susceptibility. In any practical situation, outcome variables such as the utility or reward value of withholding information, of misleading the interrogator, and of being judged guilty or else cleared, will play important roles in determining behavior under interrogation.

Since there are no procedures that guarantee either completely successful interrogation or perfectly successful concealment under hypnotic interrogation, it may be convenient to conceive of behavior under interrogation in terms of imperfect strategies of concealment by the subject competing with imperfect strategies of detection by the interrogator. For example, the interrogator's chances of successful detection of information rise with the hypnotizability of his subject. It also seems plausible, although not directly tested in this study, that subjects who are unable to resist hypnotic interrogation in experimental settings may be the ones who will be unable to resist "real-life" hypnotic interrogation. Consequently, the interrogator's decision on using hypnotic interrogation would probably be influenced by any accurate estimate he could obtain of the subject's hypnotizability (and perhaps of the subject's ability to resist a preliminary, innocuous interrogation). Ideally, the interrogator should obtain this information while still preventing the subject from countermanipulating by faking hypnosis, hypnotizability, or inability to resist a preliminary interrogation. Of course, most subjects need not adopt such exotic countermanipulations. The most natural tactics of motivated withholding and deception were usually successful in this experiment.

The control subjects, who tried to guess their responses from reading the interrogation suggestions, overestimated the power of hypnosis and underestimated the ability of the experimental subjects to resist. This seems to indicate that subjects fail to realize that a hypnotized person has powerful resources of resistance that he can use to oppose unwelcome suggestions. One implication of this finding is that a credible threat of hypnotic interrogation may be more powerful than its actual use, as suggested by Estabrooks (2) and Orne (7). If the subject can be convinced that hypnosis will really be used, he may reason that he might as well confess, since he cannot beat hypnosis—just as some subjects confess at the prospect of a polygraph. A second implication of this finding is that, from the standpoint of controls for demand characteristics (8), the most solid finding of the present study is the ability of subjects to resist, not the fact that a few were unable to do so. In other words, since the control subjects expected hypnosis to be more powerful than it was, the fact that most subjects were able to conceal information cannot be attributed to mere compliance with a perceived experimental hypothesis, or to the subjects' expectations about hypnosis. The finding that the few subjects who attempted to do so were able to lie successfully under hypnosis confirms this general picture of substantial amounts of successful resistance to hypnotic interrogation.

The most difficult technique for subjects to resist was the lie-detection technique, the next most difficult was the number-moving-forward technique, and the easiest technique to resist was the guilt technique. Data on actual revelations of information were not clearcut statistically, but were consistent with the conclusion that the lie-detection technique was one of the more difficult techniques to resist. One possible explanation of these results is that the lie-detection technique capitalizes upon involuntary, automatic responses, while the other techniques involve more voluntary, conscious cognitive processes. For example, the lie-detection technique requires only a primitive bodily movement, while the other techniques require verbal responses. The guilt and lie-detection techniques may lie at opposite ends of a continuum from persuasion to suggestion, voluntary to automatic, or aware to unaware. The practical implication is that an interrogator is more likely to be successful with hypnosis if he uses it to manipulate automatic, involuntary responses rather than voluntary, cognitive, or verbal processes. This conclusion is not surprising in view of the fact that involuntary, automatic processes are very important components of hypnotic phenomena.

This conclusion is supported by the failure to find a relationship between hypnotizability and susceptibility to the guilt technique. If the guilt technique is a relatively cognitive, verbal, or conscious manipulation, it may work as well without hypnosis or without the use of hypnotizable subjects. This conclusion must be qualified because of the very small number of subjects (only two) who revealed the information under guilt interrogation. Although we used a guessing-control group, we did not use a control group that underwent interrogation without hypnotic induction. Consequently, we cannot be completely sure that an induction of hypnosis is essential in producing any of the results reported in this paper.

Subjects tended to feel less deeply hypnotized during hypnotic interrogation than during the Stanford Form A, apparently because they felt more able to resist during the interrogation. In addition, however, some subjects may have lessened the conflict over revealing *vs.* concealing by allowing their hypnotic depth to lighten. It is also possible that the interrogation hypnosis may not have seemed as extensive or varied as the Stanford Form A, and therefore may not have seemed as deep.

E. SUMMARY

Three techniques of hypnotic interrogation were compared. The technique rated most difficult to resist was an involuntary movement in response to mention of the concealed item of information. The strategy rated easiest to resist was implantation of guilt. Although a majority of subjects concealed the item of information, 23 per cent revealed it. Hypnotizability was correlated with susceptibility to hypnotic interrogation. A control group guessing what responses they would have made under interrogation overestimated the power of hypnosis and underestimated the ability of subjects to resist.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 59-64.

AN EVALUATION OF VARIOUS THERAPY APPROACHES WITH LOWER SOCIOECONOMIC-GROUP CHILDREN*[1]

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A. INTRODUCTION

The need for early recognition and treatment of maladaptive behavior as a means of preventing serious personality disturbance is particularly evident in lower socioeconomic groups. Statistical studies have shown a disproportionately high incidence of admissions to mental hospitals from environmentally disadvantaged groups (2). Concomitantly, there has been relatively little use made of available clinical facilities for youngsters in the "high hazard" areas.

The relative lack of response by the lower socioeconomic groups appears due both to the severity of maladjustment by the time help has been sought and the lack of understanding of traditional mental health procedures and goals (3). An important basic consideration may involve the service agencies themselves. Recent evaluations of the interrelationships between social class and mental health clinics indicate that children from poorer areas receive much less extended service than those from middle-class or wealthier areas. Such findings suggest the need to develop procedures that will make clinic resources readily accessible to those whose needs for early treatment are greatest (1).

A preventive program, which seeks to maximize use of existing facilities, should then direct attention to the problem of reaching and involving those groups that are the source from which subsequent hospitalizations are most frequently made. Moreover, attention needs to be focused upon other problems that clients from lower socioeconomic groups encounter in receiving service from a traditionally oriented clinic. There are a variety of concrete problems related to the working status of these parents that are overlooked in the usual scheduling of appointments. Such considerations as physical location of the clinic, the necessity for loss of time from work, and arrangements for the care and supervision of other children are aspects of their life that are not

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* Received in the Editorial Office, Provincetown, Massachusetts, on May 29, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] The present research was conducted under the auspices of the Catholic Charities Guidance Institute, New York, and supported by Grant MH 1938-02 from N.I.M.H.

readily resolved. Each of these, in turn, contributes to the high cancellation rate associated with this group and further impairs the ability of the clinic to provide meaningful service.

Consideration of the above features strongly indicates that relocation of services to a setting that is accessible would permit a better evaluation of the effectiveness of clinic services to the lower socioeconomic group. Such a modification would attenuate the difficulties associated with distance and job-time loss. Moreover, relocation of clinic services to a local school environment further incorporates the natural strengths of the school in the community in terms of its involvement, familiarity, and proximity.

The purpose of the study was an exploration of the efficacy of a variety of approaches to short-term treatment of children from five schools in the Central Harlem area of New York City. More generally, however, we have viewed the project as an initial programmatic step to explore practical modes of clinic operation that may be most useful in providing needed primary and secondary preventive mental health measures for socioeconomically deprived groups.

B. METHOD

Clinic facilities were established within the Harlem community at one of the five participating schools. Staff included two psychiatrists, three clinical psychologists, two psychiatric social workers, a secretary, and a clinical psychologist who coordinated clinic function.

Prior to the opening of the clinic, meetings were held with the principals of the five schools to apprise them of the procedure to be followed in making referrals. In addition, arrangements were made to have clinical staff members address parents of children in the participating schools at the Parent-Teacher meetings to familiarize them with the services to be made available and to encourage their participation.

To make a clinic referral, teachers submitted for each child (*a*) a completed school information questionnaire, (*b*) a face sheet including factual data about the child and his family, and (*c*) a completed medical information questionnaire. The latter two forms were to be filled by the teacher from material obtained in interview with the parent, during which the need for evaluation of the child was discussed and the possible treatment which might be recommended was pointed out. Parental approval of clinic contact was obtained at that time.

All of the 64 referred children were seen for psychodiagnostic examination, including the following measures: (*a*) an abbreviated scale of the Wechsler

Intelligence Scale for Children (WISC), consisting of Vocabulary, Information, Block Design, and similarities; (*b*) Rorschach; (*c*) projective drawings; and (*d*) Bender-Gestalt. A five-point rating-scale format to permit quantification of the items was developed for use with the material included in the psychological report.

Following completion of psychological reports, all available material for each child (teacher's report, face sheet, medical information, psychological report) was submitted to the two psychiatrists, who independently evaluated the data to judge whether the presenting picture of the child warranted clinical referral. Each psychiatrist completed a diagnostic questionnaire based on case material for each child. All children judged by at least one of the psychiatrists as requiring clinical attention were considered to have been appropriately referred.

Those children whose referrals were considered valid were grouped into sets of four as their applications were processed; and these were randomly assigned to one of four groups: (*a*) Study only—neither child nor parent to be involved in treatment for the length of the experimental period, $N = 14$; (*b*) Child only—child to be seen in individual psychotherapy, parent not assigned to therapy, $N = 15$; (*c*) Parent only—parent assigned to group psychotherapy, child not a participant in therapy, $N = 16$; and (*d*) Traditional approach—child in individual therapy, parent in group therapy, $N = 15$. Such a procedure was utilized to insure even distribution of cases among the treatment modalities.

After group assignments were made, conferences were arranged with parents and teachers, respectively, for interpretation of findings and recommendations. Since only six months were available, the short-term nature of the planned therapy involvement was pointed out. Parents of Study-only children were told that therapy might be recommended after re-evaluation of their children at the end of the school year.

Therapy groups operated from January to June, 1966. Therapy sessions for children were scheduled largely during school hours. In some instances, children's appointments coincided with parents' therapy hours in early evening. All parents' groups met in the evening.

At the end of the experimental period, all children were re-evaluated with the original psychological tests. Teachers again completed the school information questionnaire.

C. RESULTS

Of the 41 items derived from psychological test data, seven reveal statistically significant differences among the four groups from pre- to posttesting:

viz., ratings of intellectual potential, attitudes toward father, authority, males, and females; impulse expression; and resort to fantasy as a defense mechanism. These are presented in Table 1.

In Group II, in which the children alone were involved in treatment, a significant negative trend was shown. In Group IV, in which both children and their parents participated in therapy, scores remained essentially the same. In Group III, in which only parents received treatment, significant positive change was evidenced in the children.

TABLE 1
ANALYSIS OF VARIANCE OF THE DIFFERENCE SCORES FOR THE FOUR THERAPY GROUPS ON SEVEN VARIABLES FROM THE PSYCHOLOGICAL TEST BATTERY

	Therapy groups									
	Study-only		Child-only		Parent-only		Parent-child			
Variables	pre	post	pre	post	pre	post	pre	post	F	p
Potential *IQ*	3.00	2.70	2.92	3.00	3.43	2.41	2.66	2.38	4.10	.05
Attitude: Father	4.28	3.90	3.71	3.92	3.81	3.41	3.92	3.76	5.28	.01
Attitude: Authority	4.07	3.40	3.60	3.78	3.37	3.41	3.60	3.69	3.04	.05
Attitude: Males	4.00	3.80	3.50	3.78	3.81	3.41	3.80	3.76	4.61	.01
Attitude: Females	3.92	3.90	3.71	3.64	3.87	3.33	3.93	3.84	3.67	.05
Impulse expression	3.57	3.70	3.14	3.57	3.68	3.50	3.60	3.53	2.85	.05
Extent of fantasy	3.88	3.75	4.20	3.85	4.20	4.16	4.33	4.00	2.73	.10

Some unexpected positive trend was also noted in Group I, the group having no therapy contacts. However, the factor that seems most likely to be explanatory of apparent gain is the reduction in the number of subjects. The number of children available for retest was 10; the original number was 14. Of these, three youngsters had been transferred to other schools because either academically or behaviorally they were not adapting adequately to the school setting. Therefore, it is suggested that the posttest scores represent a less disturbed group than had the pretest scores.

D. DISCUSSION

These are the kinds of data that skeptics of therapy are prone to cite: i.e., that those involved in therapy get worse, those left alone either get better or stay the same. However, let us look at what factors may be operating.

First, let us consider the nature of progress in therapy. Activation of problem areas expectedly occurs as they are in process of being worked through. It is conceivable, then, that apparent intensification of difficulty may represent movement toward improvement which has not yet been solidified in the short period of therapy. Such hypothesis could be substantiated only by continued therapy and follow-up. A second possibility is that children who are singled out for special help without their parents' involvement (Group II) may interpret that their problems are viewed as solely their responsibility—thus, possibly increasing their insecurity, guilt, and anger in regard to others. The parents might similarly assume that whatever difficulty exists has little relationship to their dealings with the child, hence justifying and perhaps even intensifying negative attitudes toward the child. It may also be suggested that these youngsters experienced increased frustration because, as their conflicts were surfacing, there was no concurrent modification of parental attitudes nor support of the youngsters' movement.

That the children in Group IV, in which both they and their parents received treatment, show no comparable negative trend may then be explained on the basis of the parents' providing some buffer to surfacing conflicts.

When this same line of reasoning (which is by no means suggested as the only avenue of explanation) is continued, generally positive trends in Group III, in which only parents were seen, may be said to reflect the significant role played by parents in their children's adjustment difficulties—that parents' increased understanding of children's needs may take place to sufficient degree in group therapy to effect improvement in the children in a short time. However, again, follow-up study would be necessary to determine whether such gains are permanent or merely a function of the parents' feeling compelled to modify their handling of the children only during the course of time that such handling is being subjected to the "examination" of the group.

In general, apart from specific measures of pupil change as a result of program offerings, the study pointed up the effectiveness of community-based clinic operation. Provision of clinic services in a neighborhood-school setting appears to encourage more interest, motivation, and participation on the part of environmentally deprived families whose adjustment problems in the past have tended to be recognized only after having become serious enough to require hospital (or court) attention.

The community-based clinic importantly encouraged greater participation on the part of both parents and children. The number of broken appointments was minimal as compared with those at the central clinic.

The importance of parental involvement shown suggests that in the lower socioeconomic groups, perhaps in particular, attention directed to the parents whose environmental stresses are recognized and who are given opportunity to ventilate and share problems is of even greater importance to the child's mental health than is direct clinical attention to the child.

Teachers in the present study were shown to have become effective screeners of maladjustment in their pupils in terms of the increased number and high proportion of appropriate clinic referrals that they initiated. The year prior to the initiation of the program, clinic referrals from the five schools numbered three.

Basing of clinic function within the school setting permitted a degree of teacher involvement in the treatment situation, which is not feasible when clinic facilities are located in a central office outside of the child's neighborhood community. Frequent conferences could be held between teachers and therapists, providing increased mutual understanding of the child's difficulties as well as recommendations and support for teachers in their handling of the children.

Instruments developed for the study proved useful evaluative tools. The construction of a checklist type of report for psychodiagnostic test findings shows promise as a device for quantifying data for screening and comparison purposes. The pupil-rating scale and therapy-rating scale were also effective.

E. Summary

The relative effectiveness of various approaches to treatment of children from Central Harlem was evaluated. Comparisons were made among the groups' pre- and posttherapy scores on several measures of adjustment. Despite limitations of sample size, length of treatment period, and sensitivity of measures of change, some significant differences were found.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 65-68.

THE MEASUREMENT OF ALCOHOLIC RESPONSE TO TREATMENT BY BARRON'S EGO-STRENGTH SCALE* [1]

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A. INTRODUCTION

Barron's (1) Ego-strength Scale (*Es*) has been used widely for predicting response to psychotherapy. Quay (6) found the *Es* scale could discriminate among female psychiatric patients, student nurses, and psychiatric attendants. The *Es* scale identified cases that later improved in treatment more reliably than clinicians making this judgment on the basis of the full Minnesota Multiphasic Personality Inventory (MMPI) profile (11). Patients in group psychotherapy with high *Es* scores benefited from therapy more than members found low on *Es* (10). Himelstein (5) found that college students in therapy had reliably lower *Es* scores than a group of nontherapy students. These results were consistent with an earlier study (7) which compared the *Es* scores of undergraduates and mental patients.

However, results from other studies have not been as consistent or as favorable. Tamkin (8), using the *Es* scale, found it impossible to separate psychotics from neurotics and character disorders. A replication (9) was likewise unsuccessful in discriminating among these groups. Gottesman (2) concluded that a very high score on *Es* could reflect ego weakness rather than strength, since a high scale score could result from a defensive attitude and extreme readiness to endorse socially desirable test statements.

B. PROBLEM

In the development of the *Es* scale, Barron (1) indicated that the scale provided a measure of a general factor of personality integration that related positively to the degree of profit an individual would receive from psychotherapy. In the present study it was hypothesized that *Es* scores would correlate with total number of interviews and continuation in treatment.

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* Received in the Editorial Office, Provincetown, Massachusetts, on May 29, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] Based on a thesis submitted by one of the authors (SKT) in partial fulfillment of the requirements for the M.A. degree, University of Alabama, under the direction of the senior author (RDF).

C. METHOD

*S*s were 118 white, male alcoholic patients admitted to a voluntary outpatient clinic. The records of white, female and nonwhite, male and female, patients were not utilized because of the small numbers represented. A standard test battery, which included the Otis Test of Mental Ability, the Alcadd, and the MMPI, was administered, and only *S*s who yielded complete records were used.

*S*s were divided into two groups. Group 1 was a continuation group which consisted of those *S*s with six or more interviews at the clinic. Group 2 was an early termination group which consisted of those who attended the clinic for less than six interviews prior to termination. The cutoff point was based on clinic procedure, which classifies a patient as "contact" until the completion of five interviews, at which time he enters the "case" category.

The mean age for the continuation group was 45.3; mean educational achievement was 11.3 grades; and mean *IQ,* 95. For the termination group the mean age was 42.4; mean education, 10.97; and mean *IQ,* 91. An analysis by chi square of age, education, and *IQ* indicated these differences to be nonsignificant. In Group 1, there was a slightly higher percentage of married patients than of single, but, again, the difference was not statistically reliable.

Upon termination of treatment, all patients who had attained case status (Group 1, continuers) were rated by the staff as to current condition. The ratings used and associated definitions follow:

1. *Condition Arrested.* Sobriety for minimum of six months; substantial improvement in the areas of social, personal, and occupational adjustment.
2. *Condition Improved.* Some control over drinking; at least minimal gains in one or more of the adjustment areas.
3. *Condition Unimproved.* Six or more interviews with no noticeable change in drinking habits or in the adjustment areas.

D. RESULTS AND DISCUSSION

The mean *Es* score of Group 1—continuers—does not differ from that of Group 2—terminators—(37.3 *vs.* 35.8). This suggests that the *Es* scale is not an effective predictor of therapy continuation in the voluntary outpatient alcoholic clinic. A comparison between the condition-arrested group and the condition-unimproved group also indicated no significant difference (38.6 *vs.* 38.3). This suggests the inadvisability of using *E*s scores as a selection device to predict improvement of alcoholics attending an outpatient clinic. Normative data compiled in other studies on the *Es* scale (2) ranges from 33.30 to 55.20; of the 17 studies reported, 15 had higher mean *Es* scores than the alcoholic group in this study (mean of 35.81).

The total population was numbered consecutively and then divided into *odd* and *even* subgroups. The *Es* scale scores were then correlated for each subgroup with the Alcadd, the Otis, the MMPI Validity Scales, the MMPI clinical scales, and two Special Scales: Alcoholism (AL) (4) and Social Status (St) (3). The *Es* scores were also correlated with the total number of interviews, age, education, and *IQ*.

The results substantiate Barron's (1) finding that *Es* scores correlate negatively with the MMPI clinical scales. A negative correlation with the F scale was found. Positive correlations were found with the *Si* and *St* scales (.01 level) and with scores on the alcoholism scale (.05) level.

In relation to other variables, *Es* correlated negatively with the Alcadd and positively with the Otis and educational level. However, there was a lack of consistency in these three, as in the K scale, correlations between the odd and even groups suggesting a high degree of variability. Also, *Es* failed to correlate with total number of interviews or with number of therapy interviews. The absence of a reliable relationship between *Es* scores and the number of interviews leads to the conclusion that the *Es* scale does not identify those alcoholics who will continue outpatient therapy at the alcoholism clinic.

E. SUMMARY

The MMPI ego strength scale (*Es*) was investigated to determine its prognostic value for an outpatient alcoholic population. The *Es* scores of 118 white, male alcoholics were obtained from a voluntary outpatient alcoholism clinic. Two groups were formed on the basis of number of interviews: Group 1 (six or more interviews) and Group 2 (less than six). Two other groups of patients were selected from among those rated by the clinic staff. Those patients who discontinued treatment prior to the sixth interview were expected to have relatively low *Es* scores; those who continued treatment were expected to have relatively high *Es* scores. The same relationship was expected of the condition-arrested and the condition-unimproved groups. Statistical analysis failed to support these expectations. No significant difference between the *Es* scores of improved and unimproved groups was found. *Es* scores do relate negatively to the MMPI clinical scales. No evidence was found for a consistent relationship between *Es* scores and background factors such as *IQ*, education, or age. Normative data indicate that subjects in this study yielded *Es* scores lower than most other groups reported. Only two unimproved hospital groups exhibited lower scores.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 69-74.

AN EVALUATION OF THE MARYLAND PARENT ATTITUDE SURVEY*[1]

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A. INTRODUCTION

Recently Pumroy (2) developed a research instrument, the Maryland Parent Attitude Survey (MPAS), to measure child-rearing attitudes, with the objective being the control of the social desirability set. This scale was intended to overcome the criticism directed at widely employed parental attitude inventories, such as the Parental Attitude Research Instrument (PARI) developed by Schaefer and Bell (4), which are thought to be vulnerable to the response set of social desirability to an unknown extent. The MPAS consists of 95 items, calling for a forced-choice response in each case between two paired statements. The pairing of statements was based on (*a*) the type of parents they represented, according to psychologist judges, and (*b*) the distribution of responses of a group of subjects who had been instructed to answer as they thought a good parent would. The four types of parents, corresponding to the scales, are Disciplinarian, Indulgent, Protective, and Rejecting. The test is scored by adding the number of statements chosen for each of the categories. Since the items do not refer specifically to mother or father, they seem to have broader applicability than do the PARI statements.

In view of the fact that the development of the MPAS employed a method of control for social desirability that called for subjects to answer the items in accord with their perceptions of "good" parents, it was felt desirable to check on the adequacy of the control by relating scale scores to an independent measure of social desirability: namely, the Marlowe-Crowne Social Desirability Scale (1). Secondly, this paper presents replication data on the intercorrelations between scales, to determine the meaningfulness of reference to discrete scale scores. A third purpose of this study is to test the validity of the instrument by relating it to a personality dimension that should theoretically be associated with parental attitudes. This variable is the generalized expec-

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* Received in the Editorial Office, Provincetown, Massachusetts, on May 31, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] The assistance of Mrs. Susan Orange with the statistical analyses is gratefully acknowledged.

tancy or belief in internal or external control of reinforcement and is measured by Rotter's (3) I-E scale.

B. Procedure

Two separate studies, employing different samples but identical procedures, were conducted to provide replication data on the results obtained.[2] The first sample consisted of 22 subjects, all of whom were teachers who had participated in an inservice program to help increase their effectiveness in dealing with children's emotional problems in the classroom. In this group all but one were females. The second group consisted of 25 male and nine female students enrolled in a graduate course in psychological testing.

The following instruments were group-administered in the stated order: Rotter's I-E scale, the MPAS, and the Marlowe-Crowne Social Desirability Scale. The I-E scale is a 29-item forced-choice test measuring subjects' generalized expectations about how reinforcement is controlled: i.e., whether by internal or external means. The I-E scale is scored by totaling the number of external choices so that a high score indicates an expectancy that rewards or reinforcements will follow from forces that are outside of oneself and that are independent of one's actions. A low score indicates that the subject believes rewards or reinforcements are contingent upon his own behavior or characteristics. Rotter (3) cites several studies in support of this scale's discriminant and construct validity. Test-retest correlations of .60 and .78 are reported with a one-month interval.

The MPAS was administered with the instructions that subjects choose the one statement from each pair that most characterized their own point of view. The instrument contains 45 statements representing each type of parent, forming 90 pairs of items. There are also five buffer items at the beginning. Test-retest reliability, with a three-month interval, ranges from .622 to .730, according to Pumroy (2). He also reports some tentative findings that may support the test's validity in certain situations.

The Marlowe-Crowne Social Desirability Scale (M-C SDS) consists of 33 items that are to be answered true or false. Of the 33 items, 18 are keyed true and 15 false. The M-C SDS eliminates pathology-relevant item content to a large extent, and draws items from a population of items describing behaviors that are culturally sanctioned and approved but that are relatively unlikely to occur.

If the MPAS is indeed free of the social-desirability-contaminant response set, then one would expect a nonsignificant relationship to obtain between the M-C SDS Scale and each of the four MPAS scales. As for the MPAS intercorrelations, Disciplinarian scores should correlate significantly and negatively with the Rejecting attitude. On the other hand, it is hypothesized that Indulgent and Protective attitudes should be positively associated.

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[2] Appreciation is extended to Dr. Vincent M. Murphy for making available one group of subjects.

If one turns from the analysis of internal relationship of scales within the MPAS to a determination of the relationship between the MPAS and an external variable, one would expect that, if the MPAS is valid, an Indulgent attitude would correlate positively with the I-E scale, and a Disciplinarian attitude would correlate negatively with the I-E scale. These predictions follow from the definition of Disciplinarian and Indulgent parental attitudes. Disciplinarian parents ". . . need and expect fairly strict obedience from the child. The child knows that if he does not comply he will be punished, as the rules are explicitly stated by the parent. The punishment is carried out in a fair and consistent manner" (2, p. 75). These seem to be the very conditions most conducive to the development of an expectation that success or failure is determined by one's own actions or characteristics. On the other hand, the Indulgent parental attitude is described as ". . . the child is allowed to have his own way in all matters. . . . While there are attempts at discipline, the child knows the rules can be circumvented. The child is not encouraged to show any initiative, and seldom does he have any responsibilities around the house. Frequently, but for no particular reason other than an impulse on the part of the parent, the child is given gifts and treats" (2, p. 74). These seem to be the conditions that provide a fertile ground for the development of an expectancy that success and failure are determined by external factors over which the subject has no control.

C. RESULTS

It is obvious from the nonsignificant, near-zero correlations between each of the four MPAS scales and social desirability reported for both samples in Table 1 that social desirability has been quite satisfactorily controlled on the MPAS.

Table 2 presents the intercorrelations among the four scales. It should be noted that, while one may question the advisability of employing a correlational procedure based on measures that are not independent, this method was used by Pumroy (2) and is here being replicated on different samples. The top entry in each cell represents the product-moment correlation based on the first sample; the bottom entry represents the second sample. These findings indicate, as hypothesized, that Disciplinarian parental attitudes correlate significantly and negatively with Indulgent parental attitudes as do Protective attitudes with Rejecting attitudes. These two consistently obtained inverse relationships support the subdivision of the MPAS into different parental scales. Contrary to prediction, however, Indulgent and Protective attitudes are not positively correlated, which finding calls, perhaps, for a re-examination of the definition of at least one of these scales. It is noteworthy that these results stand in close agreement with those reported by Pumroy (2).

TABLE 1
CORRELATIONS BETWEEN MPAS SCALES AND SOCIAL DESIRABILITY

Scale	Group 1 ($N = 22$)	Group 2 ($N = 34$)
Disciplinarian	.081	.122
Indulgent	—.282	—.072
Protective	—.092	—.054
Rejecting	.273	—.118

TABLE 2
MPAS SCALE INTERCORRELATIONS FOR TWO SAMPLES

Scale	Indulgent	Protective	Rejecting
Disciplinarian	—.478* —.741**	—.093 —.193	—.263 —.156
Indulgent		—.348 —.074	—.276 —.262
Protective			—.567** —.534**

* Significant beyond .05 level.
** Significant beyond .01 level.

The validity of the MPAS was determined by testing for the hypothesized positive relationship between Indulgent attitudes and the I-E scale, and the hypothesized negative correlation between Disciplinarian attitude and the I-E scale. Prior to a determination of these relationships, the I-E scale was examined for social desirability so that if such a set existed it could be controlled for statistically. In view of the nonsignificant (r of .264 for the first group and —.095 for the second sample) relationship between the M-C SDS and the I-E scale, it can be concluded that the I-E scale is free of the social desirability set, as was claimed by its author.

Neither of the two hypothesized relationships was corroborated, as can be seen from Table 3. The only significant relationship is a negative one, contrary to expectation, in the case of the first sample between I-E and Indulgent attitudes. This would suggest that a high internal orientation is associated

TABLE 3
CORRELATION COEFFICIENTS FOR MPAS SCALES AND I-E SCALE

MPAS Scales	Correlation with I-E Sample 1	 Sample 2
Indulgent	—.511*	.017
Protective	.110	—.026
Rejecting	.260	.260
Disciplinarian	.218	—.210

* Significant beyond .05 level.

with Indulgent parental beliefs. However, since there is no support for this finding on replication, it appears to be only a chance relationship to which little significance should be attributed.

D. DISCUSSION

In an attempt to evaluate further the validity of the new MPAS, two separate studies were undertaken, which provided cross-validation data. The findings indicate unequivocally that social desirability has been successfully controlled in the construction of this parental attitude instrument. Moreover, the intercorrelations among the scales generally support the rationale underlying the identification of specific scales that are said to correspond to parental types. The exception to this generalization is the fact that Indulgent and Protective responses are not positively correlated, as one might expect on the basis of the scale definitions. This finding points to the need for some conceptual changes in one or both of these scales to effect a closer alignment with the data obtained.

Perhaps the most interesting findings pertain to the fact that none of the MPAS scales is consistently or significantly related to an internal *versus* an external orientation. Certainly it seems consistent with most personality theories to ascribe great significance to parental behavior and attitudes as determinants of personality sets, including the expectancy of the person that his own behavior is chiefly responsible for his successes or failures or that forces beyond his control lead to his successes or failures. If the Indulgent parent bestows reinforcement on the child irrespective of the child's behavior, the youngster should develop an external expectancy. Conversely, the Disciplinarian parent who, as defined on the MPAS, employs a schedule of reinforcement that is based on the child's behavior, should produce an internally expectant offspring. Yet neither of these relationships was obtained. Whether the nonconfirmation of the hypothesized relationships is a function of the lack of validity of the MPAS or is a result of the fact that the procedure called for responses on the MPAS and the I-E from the *same* subjects, rather than parent and child subjects, cannot be settled without recourse to further research. It is suggested that future work correlate parental attitudes of parents with the internal-external expectancies of their children.

E. SUMMARY

The Maryland Parent Attitude Survey (MPAS) was evaluated in terms of its susceptibility to the social desirability set, the internal relationships of its component scales, and its validity in relation to the variable of expectancy of internal *versus* external control. The instrument was found to be free of the social desirability set, in general to have its four subscales demonstrate the expected internal relationships (with one important exception), and to exhibit no association with the subjects' internal *versus* external attitude.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 75-82.

INTENSIVE SUPERVISION BY PAROLE OFFICERS AS A FACTOR IN RECIDIVISM REDUCTION OF MALE DELINQUENTS*[1]

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A. INTRODUCTION

Among the goals of experimental programs related to youthful offenders has been the search for methods of predicting and preventing repeated delinquent behavior. However, on the basis of recent crime statistics (9), present preventive procedures are failing to meet current needs, let alone reduce the problem. Although variables such as age, seriousness of offense, adjustment to the institutional environment, as well as several personality measures, may sometimes significantly predict recidivism (1, 2, 3, 4, 7, 11), many other variables are unreliable or based upon false assumptions (6). Also, the complex economic, legal, and social constraints imposed on the delinquent often make it difficult to isolate and control the predictor variables.

Because re-education of youthful offenders may require many exogenous as well as endogenous agents of change, it seems unlikely that any one strategy would uniquely reduce recidivism. However, among those factors under administrative control, it would seem that the selection, training, and assignment of parole officers could greatly influence parolee behavior. These parole officers not only provide socially acceptable role models for parolees, but also provide supervision that may anticipate and deter new delinquent acts. The purpose of the present study is to evaluate the effectiveness of a special selection and training program for parole officers as a factor in recidivism reduction of male delinquents.

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* Received in the Editorial Office, Provincetown, Massachusetts, on June 2, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This research was supported by Grant Number 65215, Office of Juvenile Delinquency and Youth Development, Department of Health, Education, and Welfare.

[2] The training and research reported in this study were made possible by the assistance and support of the staff of the Law-Medicine Institute under the direction of Dr. Donald H. Russell. Dr. John D. Coughlan, Director of the Division of Youth Service, Commonwealth of Massachusetts, and Dr. Francis Kelly have not only generously contributed facilities and staff, but have encouraged the use of available data related to the evaluation of the Educational Counselor Program.

B. METHOD

1. *Selection and Training of Parole Officers*

As part of the experimental Educational Counselor Program initiated by a grant from the Legislature of the Commonwealth of Massachusetts to the Division of Youth Service, 12 males of median age 30 were employed as parole officers. Although they had little experience in the field, they were all college graduates who had majored in the social sciences, and each had expressed a strong motivation to work with youthful offenders.

The staff of the Training Center in Youth Development of the Law-Medicine Institute trained these counselors using group training procedures similar to those employed in industrial settings. Among the objectives of the program, it provided the parole officers with information on counseling procedures and the effective utilization of community resources. The 45 training sessions were extended over a one-year period, which began a few months prior to contact with the parolee and continued throughout the period of parole. Each session lasted from a few hours to an entire day.

A unique factor of the program was that the counselors had their first contact with the parolees while the parolees were still institutionalized. This procedure provided a greater than usual opportunity for support and assistance of parolees during their transition from an institution to the community. Also, to allow the counselors to have more than routine contact with their parolees, the caseload of these men was reduced from the usual 75 to 25.

2. *Parolee Selection*

Parolees were male adjudicated delinquents assigned to the Massachusetts Youth Service Board. Only youths from urban, high-delinquency-rate areas were eligible for selection and assignment to one of three delinquent groups. The Historical Group consisted of those individuals released from institutions from October 1, 1961, to August 1, 1962, while the Contemporaneous Group was selected from among those parolees discharged from October 1, 1964, to August 1, 1965. Except for being matched with the two groups that included a similar number of cases released in each month of the year from similar institutions, parolees were randomly selected from among qualified candidates. The Experimental Group youths were similar in background to those in the Contemporaneous Group, except that they were assigned by the Youth Service Board to one of the 12 specially trained parole officers. The selection procedure resulted in an initial sample of 181 Historical, 182 Contemporaneous, and 154 Experimental Group parolees. Because the present research project was not initiated until after the beginning of the treatment of the Experimental Group, it was necessary to select the two control group parolees *post hoc*.

3. *Matching of Groups*

For the original sample of 181 Historical Group parolees, 11 independent and three dependent variables were examined with linear regression analysis. A significant ($p < .01$) multiple R of .413 resulted in a regression equation with five independent variables—(*a*) number of commitments to an institution for a new offense prior to the last parole; (*b*) *IQ*; (*c*) Family status; (*d*) Age of first incarceration; and (*e*) Number of months of incarceration—contributing most to the prediction of the dependent variable, which was the number of months of incarceration subsequent to parole in the program. On the basis of this result, cases were removed from the three groups until insignificant ($p > .05$) mean differences were observed between groups for each of the five variables. This procedure resulted in the matched groups of 157 Historical, 152 Contemporaneous, and 95 Experimental Group parolees.

C. RESULTS

Using t tests of the difference between means and chi square analysis of 2 × 2 contingency tables of group by variable data, the experimental and control groups were compared with each other for 12 background and offense variables. Because no significant differences ($p > .05$) were observed between groups, Table 1 merely summarizes the group mean or per cent of cases for each variable. Obviously, many of these 12 measures were not independent due to the fact that behavior identified by one variable would limit the possible range of behavior associated with one or more other variables. Thus, the younger the delinquent at the time of first commitment, the greater the opportunity after parole to commit new offenses identified as juvenile rather than adult. Also, the greater the health impairment or the more months that the youthful offender was incarcerated, the greater the number of years he would be behind the expected grade level. In any case, these three groups would seem sufficiently similar prior to release on parole for this study so that some estimate could be obtained of the effectiveness of the Educational Counselor Program.

Table 2 summarizes the percentage of cases of each type of recidivism committed by parolees of the three groups during the six-month period of the study. Because the chi square analyses of the 2 × 2 tables formed by comparing the number of cases in groups with the types of recidivism were insignificant ($p > .05$), it would appear that the Educational Counselor

TABLE 1
CHARACTERISTICS OF MATCHED HISTORICAL, CONTEMPORANEOUS, AND EXPERIMENTAL DELINQUENT GROUPS PRIOR TO RELEASE ON PAROLE FOR THIS STUDY

		Group	
Characteristic	Historical ($N = 157$)	Contemporaneous ($N = 152$)	Experimental ($N = 95$)
		Means	
Age of first court appearance (years)	12.7	12.9	12.5
Age of first incarceration (years)	13.8	13.8	13.3
IQ	88.9	88.5	92.6
Number of court appearances with adjudication for a new offense	2.9	2.9	3.6
Number of court appearances without adjudication	.6	.8	.6
Number of commitments with adjudication for a new offense	1.6	1.8	1.6
Number of commitments without adjudication for a new offense	.3	.4	.5
Number of months incarceration	15.9	15.5	13.7
		Per cent	
Race			
Caucasian	78	66	74
Negro	22	33	25
Other	0	1	1
General health			
With impairment	41	38	26
Without impairment	59	62	74
Family status			
Both parents in home	57	48	54
One parent in home	36	44	39
Foster home	5	6	3
Other	2	1	2
Years behind expected grade level:			
none	17	14	21
1	25	18	28
2	30	22	30
3	22	28	15
other	6	19	6

Program was no more effective in reducing recidivism than the usual parole officer program. However, alternative explanations should also be considered when evaluating these results.

The types of offenses committed by the delinquents both before and within six months after release on parole for this study are summarized in Table 3.

TABLE 2
INCIDENCE OF RECIDIVISM OF DELINQUENTS WITHIN SIX MONTHS AFTER RELEASE ON PAROLE FOR THIS STUDY

Type of recidivism	Historical (*N* = 157)		Group Contemporaneous (*N* = 152)		Experimental (*N* = 95)	
	Number	%	*Number*	%	*Number*	%
No record of recidivism	82	52.2	85	55.9	49	51.6
Court appearance but not adjudicated or returned to institution	4	2.6	4	2.6	8	8.4
Appeared in court with adjudication and not returned to institution	11	7.1	6	4.0	1	1.1
Returned to institution by court without adjudication	10	6.3	9	5.9	10	10.6
Returned to institution by court with adjudication	22	14.0	21	13.8	10	10.6
Returned to institution by parole officer without adjudication	24	15.3	26	17.1	15	15.5
Returned to institution by parole officer with adjudication	1	.6	0	0	1	1.1
Other[a]	3	1.9	1	.7	1	1.1
Total	157	100.0	152	100.0	95	100.0

[a] Some delinquents returned to institutions twice.

TABLE 3
TYPE OF ADJUDICATED OFFENSES COMMITTED BY DELINQUENTS BEFORE PAROLE AND DURING SIX MONTHS AFTER RELEASE ON PAROLE FOR THIS STUDY[a]

Type of offense	Historical (*N* = 157)		Group Contemporaneous (*N* = 152)		Experimental (*N* = 95)	
	Per cent of group for period					
	Before parole	During parole	Before parole	During parole	Before parole	During parole
Illegal use of motor vehicles	36.3	8.2	44.3	4.0	29.5	7.4
Larceny	46.5	4.5	51.3	4.0	47.4	1.1
Breaking & entering	45.2	1.3	36.2	2.0	32.6	1.1
School offender	8.3	1.3	9.2	.7	8.4	0
Assault	8.9	0	9.8	1.3	8.4	1.1
Stubborn child	11.5	.6	13.8	.7	15.8	0
Sex	4.5	1.3	6.6	0	6.3	1.1
Arson	4.5	0	4.6	.7	7.4	0
Other	28.7	0	28.9	.7	29.5	3.6

[a] Some delinquents committed two or more offenses.

Illegal use of motor vehicles, larceny, and breaking and entering account for the majority of offenses committed by the delinquents. In general, a similar percentage of cases for each type of offense is found in the groups both before and after release on parole for this study. The large decrease within the groups for the two occasions occurred because the percentages were based upon the total number of cases, and not all delinquents were adjudicated for a new offense during the six-month postparole period. Again chi square analysis revealed no significant difference between groups ($p > .05$) either prior to or after release on parole for this study. Thus the expectation that the Educational Counselor Program might be more effective for delinquents committing certain types of offenses was not supported.

D. Discussion

Although the insignificant results of this study are consistent with other programs (8, 12) that have attempted to reduce recidivism by offering parolees some special care, several factors should be considered when evaluating the effects of the Educational Counselor Program. Since the follow-up period extended for only six months after parole, there may not have been sufficient time for the counselors to develop a constructive relationship with the parolees. Also, since recent evidence (5) suggests that new offenses by parolees continue at an increasing rate until 18 months after release from an institution, a comparison of recidivism rates over a longer interval might have more clearly differentiated the groups.

Because the Experimental Group parole officers had a greater opportunity to become aware of illegal or adjustment problems of their parolees than the other officers for theirs, the recidivism rate for this group may have been somewhat exaggerated by unfavorable decisions at the judicial level. On the other hand, a relative absence of information (10) could have contributed to the underestimation of delinquent acts for the control groups. If it is assumed that, in general, these Experimental Group parolees were responding favorably to the special supervision, then a low recidivism rate would be confounded with the more complete reporting of delinquent acts during the six-month parole period. The overall effect could account for the insignificant difference in recidivism between the experimental and control groups. In this way, the Educational Counselor Program may have been successful in reducing recidivism and, yet, appear to be no more effective than the usual supervisory practices of parole officers.

Another influence that may have contributed to the present outcome is the method of matching the control and experimental groups. A person-for-person match might have more adequately reflected the effectiveness of the experimental program than the group match for means, *SD*s, or per cent of cases of a particular type. However, not only would this have limited the number of cases even more than that for group matching, but it is doubtful that these samples would then have been representative of the delinquent population under study.

Because this research was restricted to urban, high-delinquency-area parolees, delinquent offenders having other types of backgrounds might respond differently to the Educational Counselor Program. A better experimental design would have been to select only those candidates who, on the basis of some objective criteria, offered most promise of success in the program; and, after a person-to-person match, to have randomly assigned these cases to the experimental and control groups.

Finally, less measurable factors may have contributed to Experimental Group performance. Selection by the Youth Service Board staff of parolees for this program was to some extent influenced by their psychological needs and characteristics. In this way, difficult cases, not identifiable by the 11 objective independent and three dependent variables included in the regression analysis, were sometimes assigned to the experimental program in order that they could receive improved care and supervision. To reduce this effect, it might have been helpful to have matched the experimental and control groups on more clinical estimates of personality adjustment, or else have more completely randomized the assignment of cases to the groups. However, practical considerations of the program precluded this possibility.

One unanswered question of this study is the extent to which the Educational Counselor Program had a positive effect on youthful offenders, which was not reflected in their recidivism records. Although this latter objective measure suggests immediate success or failure, the parolees in the experimental program may have gained other intangible yet important benefits. Perhaps a comparison of the complete criminal careers of control and experimental group parolees could answer this question.

E. SUMMARY

In order to evaluate the effects of a special selection and training program of parole officers on recidivism reduction of male delinquents, two control groups of 157 Historical and 152 Contemporaneous Group parolees, all of whom were supervised by regular parole officers, were compared with 95 Experimental Group parolees, who were supervised by 12 specially trained counselors. The three groups were initially matched for 11 background and offense variables. However, when comparison was made for delinquent acts committed during the six-month postparole period of this study, no significant differences were found in the per cent or type of recidivism among the groups. Results should be cautiously interpreted because of the relatively short observation period, factors contributing to the selection of the Experimental Group parolees, and the increased opportunity for the counselors of these parolees to observe maladaptive behavior.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 83-84.

THE SYNONYM VOCABULARY TESTS: FORMS I AND III COMPARED*

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A. INTRODUCTION

It is the purpose of this article to show how the two forms of the Synonym Vocabulary Test perform when applied to two discretely definable populations, a heterogeneous population of undergraduate students and a relatively homogeneous group of graduate students in psychology.

B. THE TESTS

Form I and Form III of the tests have been described, in detail, in previous publications (1, 2). Each instrument consists of matching-type items. The items are constructed with five stem words and 30 response words. Form I, having eight such items, requires 240 responses. Form III, with nine items, provides for 270 matches. The important difference between the forms is in *cognitive complexity*, or, in terms of what is required of the respondent, *cognitive flexibility*. By way of explanation, all of the synonym response words to a given stem-word in Form I were taken from the *same meaning category*. In contrast, the response words for each stem-word in Form III were taken from *as many clearcut meaning categories as were available*.

C. TEST ADMINISTRATION AND RESULTS

Some readers will discern that the values in Table 1, concerning the undergraduate population, were published in a previous issue of this journal (2). They are repeated herein to facilitate the planned comparisons.

The population of 106 graduate students was tested over a period of several years; but, for the most part, in the early months of their graduate training and within a span of years wherein admission, training, and evaluation procedures were essentially uniform.

The summary of results is contained in Table 1.

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* Received in the Editorial Office, Provincetown, Massachusetts, on June 5, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

TABLE 1
STATISTICAL TREATMENTS AND COMPARISONS; UNDERGRADUATE POPULATION (UG) $N = 405$, GRADUATE STUDENT POPULATION (G) $N = 106$

Statistic	Form I UG	Form I G	Form III UG	Form III G	Value UG	Value G
Reliability	.94	.86	.93	.90		
Mean, raw scores	154.45	190.68	133.38	187.97		
SD, raw scores	22.78	14.18	26.18	21.71		
Mean diff. (% right) I-III					14.96	9.81
SD, mean diff.					7.80	5.76
SE, mean diff.					0.39	0.56
Ratio (t)					38.36	17.52
$r_{\mathrm{I.III}}$					.66	.70

D. INTERPRETATIONS AND CONCLUSIONS

With regard to Table 1, attention is invited to the following: (*a*) For both forms the reliabilities are somewhat lower for the graduate cases. It is suggested that this may be attributed to the restriction of ranges, as indicated by the smaller Standard Deviations in the graduate data. (*b*) It will be noted that, in terms of percentages of correct responses, Form III appears to be more difficult than Form I for both populations. Here, as previously (2), this is attributed to the cognitive complexity factor. The difference appears to be larger for the undergraduate group. (*c*) The small difference between the intercorrelations for the two populations (.70 — .66) is, by usual standards, nonsignificant. (*d*) Finally, as might be expected, the graduate students outscore the undergraduates on both forms. The t ratios (not shown in the table) were computed to be 20.35 and 21.92 for Forms I and III respectively.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 85-89.

RESPONSE TO STIMULUS CHANGE IN THE OPOSSUM*

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A. INTRODUCTION

Spontaneous alternation by rats in Y and T mazes can either be explained in terms of (*a*) response alternation theories, such as Hull's (7), which emphasize "reactive inhibition" of the previously made response or (*b*) stimulus alternation theories, such as those presented by Montgomery (8) and Glanzer (5), which emphasize satiation by the animal for the previously presented stimulus.

A version of the stimulus alternation theory, which has the advantage of wider generality than the stimulus satiation theories of Montgomery and Glanzer, was put forward by Dember (1), who suggested that spontaneous alternation could be explained in terms of "exploration of novel stimuli." Dember provided evidence for this position by demonstrating that rats, when exposed to, but not allowed to enter the arms of a T maze that had one black and one white arm, would, on the next trial, enter the arm that had been changed. These results could not be accounted for on the basis of simple satiation theory, since on the first trial the *S* was equally exposed to and, therefore, equally satiated for, both black and white. This response by the rat to stimulus change or "novelty" has been subsequently confirmed both by Dember and other investigators (2, 3, 12).

Support for the species generality of this response was provided by Hughes (6), who demonstrated a response to stimulus change in the Dember situation in ferrets (*Mustela Utorius*). The current experiment was initiated to discover if opossums would also exhibit this response.

B. METHOD

1. *Subjects*

Eight Virginia opossums (*Didelphis marsupialis virginiana*), five males and three females, were used as *S*s. All *S*s were from the same litter and were

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* Received in the Editorial Office, Provincetown, Massachusetts, on June 5, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This research was supported by the Department of General Research and the Graduate School of the University of Georgia.

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330 days old at the start of the study. Six of the *S*s were housed in large galvanized or stainless steel cages, and two males were housed together in a large wire cage. All of the *S*s had been utilized previously in studies of social facilitation of eating behavior (9, 10), and had not been used previously in any maze or choice-box studies. All animals were relatively tame, with some individual differences in the manner in which they responded to handling. *S*s were used to eating during the day, but were most active at night. All *S*s were given their daily ration of food approximately 30 minutes before being removed from their cages. Water was available *ad lib.* *S*s were thus satiated for food and water during the experiment.

2. *Apparatus*

The experimental apparatus was a Y maze, constructed of tin, and almost completely covered by a wood ceiling, except for openings for air circulation, which were wire covered. Each of the goal arms was 18 inches long, 8 inches wide, and 12 inches high. The goal arms were placed at a 120-degree angle to each other. Each was illuminated by an overhead 40-watt bulb. The entrance alley was also 18 inches long, 8 inches wide, and 12 inches high. The 18-inch length was approximately half its usual length and was shortened for the present study by means of a wooden door. This was done so that the animals, which are extremely photosensitive, would not retreat too far down the alley to avoid the illumination from the bulbs in the goal arms. The colors of the arms were changed by means of heavy paper inserts. Clear plexiglass guillotine doors separated the arms of the maze from the entrance alley.

3. *Procedure*

As in previous studies (1, 2, 3, 6, 12), four stimulus conditions were utilized. On Trial 1, the two arms were arranged either black-left, white-right, or black-right, white-left. On Trial 2, they were either black-black or white-white. The same eight *S*s were run on each of four consecutive days, two *S*s under each of the four stimulus conditions. No *S*, on any of the four consecutive days, was ever presented with the same stimulus condition twice. Thus, S_1 on Day 1, was presented with the following stimulus condition: Trial 1, black-left, white-right, Trial 2, both black; on Day 2; Trial 1, white-left, black-right, Trial 2, both black; and so on for the next two days. In the present experiment, as in the Dember (1) study, only one exposure period, 15 minutes, was used.

Each *S* was brought into the experimental room individually in a cardboard carton, the appropriate stimulus conditions having been prepared in advance. The *S* was placed in the starting alley of the T maze and allowed to explore freely, but could not enter the goal arms. At the end of the 15-minute period, the opossum was removed from the maze and replaced in the box. Changes were then made in the appropriate maze arm, and the plexiglass partitions removed. The animal was then replaced in the starting alley for the second trial.

C. Results

Of the 32 stimulus changes to which the eight *S*s were exposed (four for each *S*), a total of 22 responses were made in the predicted direction: i.e. the animal entered the changed arm. These results, when analyzed by means of the sign test, were significant at the .025 level of confidence ($z = 1.945$). When the distribution of errors was examined for position effects (i.e., did *S*s continually make left or right errors, or repeatedly choose the white or black arm?), none seemed to be indicated. Examination of the data did indicate, however, that errors were disproportionately distributed among the eight *S*s. Two animals accounted for six errors, and these two, together with a third, accounted for eight of the 10 errors.

D. Discussion

The results of this study support Dember's (1) suggestion that *exploration of novel stimuli,* with novel stimuli represented in the form of a change in the color of one maze arm, rather than simple satiation, is responsible for alternation in the T or Y maze. The current study, in extending Dember's findings to another species, also provides further support for the generality of this explanation. It is of interest to note that in this study, the opossum made 10/32 or 31.25 per cent turns in the direction opposite to that predicted, while Dember's rats made 3/20 or 15 per cent; Walk's rats 5/25 or 20 per cent; and Hughes' ferrets 4/20, or 20 per cent turns in the opposite than predicted direction. This may perhaps be due to (*a*) the use of the same *S*s under four stimulus conditions in the current study, as compared with previous experimenters' use of each *S* under one condition, or (*b*) differences in alternation behavior between the opossum, rat, and ferret. The second alternative would appear the more likely explanation for the following reasons: First, no animal in the current study was presented with the identical stimulus situation on successive trials. Secondly, Tilley *et al.* (11) have found that, while the opossum does alternate in the T maze situation, the percentage of alternations is lower than that typically found with rats.

The finding that three of the *S*s accounted for 80 per cent of the turns in the unpredicted direction is particularly interesting when examined in the light of findings in a previous study by the authors (10) utilizing these same animals. In this study two of these animals had been rated as highly emotional and aggressive, while the third had been rated as slightly to moderately so. Tilley *et al.* (11) also reported that the one *S* in his study who did not demonstrate spontaneous alternation behavior was the least tame of the five opossums he used. Thus it would appear that an inverse relationship exists between emotionality and tameness on one hand, and the response to stimulus novelty or change, on the other. Such a view is supported by Fowler (4), who provides evidence for alternation and curiosity responses being at a minimum when arousal is at very high or very low levels. High emotionality would most certainly appear to be indicative of high levels of arousal.

E. Summary

The current experiment was an attempt to demonstrate a response to stimulus change in the opossum. Eight opossums, 330 days of age, were exposed to, but not allowed to enter the arms of a Y maze, one of which was black and the other white. By this procedure, *S*s were equally satiated for both black and white. On a second trial the color of one arm was changed, so that the *S*s were now presented with two black or two white arms. Under these conditions, a significantly larger number of *S*s entered the arm whose color had been changed. These findings are in accordance with the suggestion by Dember that alternation behavior can be explained in terms of "exploration of novel stimuli." The current study thus provides support for this explanation by demonstrating the presence of a response to stimulus change in the opossum. Some suggestions are also made as to the possible causes of individual differences in the response to stimulus change in the opossum.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 91-97.

THE RELATIONSHIP OF PSYCHOMETRICALLY DETERMINED PERSONALITY VARIABLES TO PERCEPTION OF THE AMES TRAPEZOIDAL ILLUSION. I*

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A. INTRODUCTION

Several studies have stressed the existence of an empirical relationship between perceptual behavior and personality variables. Thurstone's factorial study (18), for example, hypothesized that spontaneous set in making perceptual judgments was directly related to personality factors that characterized the subject as an individual. His data supported this position in correlations obtained between susceptibility to illusion and personal-contact-type leadership. Solley and Murphy (17) considered subjective need and subjective set major factors in perception. The Transactionalist position of Ames and his associates (2, 5, 9, 10, 11, 16) was based upon the concept that individual differences in perceptual behavior were determined by such factors as individual past experience, expectancies brought to the perceptual task, and, indeed, even the personality adjustment of the subjects.

Ames (2) has pioneered in using an ambiguous stimulus situation as the vehicle for revealing the separate determinants in the perceptual process. Baker (4) applied this approach in his research which attempted to identify personality variables underlying the perceptual process. He correlated the number of reversals perceived on the Ames Rotating Trapezoid with scores obtained on the various subscales of the Guilford-Zimmerman Temperament Survey. Basic to Baker's work (4) was the finding of Zegers and Murray (19) that subjects could be classified according to the number of reversals they perceived in viewing a rotating trapezoidal target into "perceivers" (high per-

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* Received in the Editorial Office, Provincetown, Massachusetts, on June 6, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This study was submitted in partial fulfillment of the requirements for the degree of Bachelor of Arts in Psychology at Mercy College of Detroit. The author wishes to express her sincere gratitude to Dr. M. L. LaDriere for her careful guidance as mentor of this dissertation and to Corrinne Arena and Mary Murphy, formerly of Marymount College, for making their data available to her. She also wishes to extend her appreciation to Dr. Margaret K. Cappone for her interest and advice in the preparation of this manuscript.

ceivers), intermediate perceivers, and "nonperceivers" (low perceivers) of the illusion. Baker (4) hypothesized that it should be possible to distinguish between the high perceiver and the low perceiver on the basis of specific personality traits. To test this hypothesis, he administered the Guilford-Zimmerman Temperament Survey to 48 female college undergraduates who then viewed the luminous trapezoidal target rotating in a totally darkened room. Two viewing distances were used, seven and 14 feet from the target, which corresponded to the distances of maximal and minimal perception of the illusion according to Zegers and Murray (19). Baker's interest (4) in the results of Solley and Murphy (17) was evidenced by his introduction of two conditions of mental set into his experimental design. Thus, in two of the four viewing sessions, subjects were told the truth concerning the target's rotary motion and the nature of the illusion. This constituted the low mental set condition. In the other two viewing sessions, subjects were informed that the experimenter controlled the direction of movement of the target, a suggestion enhanced by apparent changes in motor sound and speed and the occasional emission of audible clicks of a switch during viewing sessions. Thus, the experimenter was supposed to be causing the target to reverse its motion at random times during the testing. Although no actual changes were made in the constant speed and direction of target rotation, subjects were told that they were expected to notice when mechanically produced reversals occurred. This constituted the condition of high mental set. It should be noted that later statistical analysis of the data revealed no significant differences in perceptual performance between the two conditions of expectancy. Baker's data (4) yielded significant positive correlations between the number of reversals perceived in all four viewing sessions and scores obtained on the Guilford-Zimmerman subscales of Friendliness, Objectivity, and Personal Relations. On the basis of this evidence, Baker (4) concluded that the personality of the high perceiver was characterized by traits of objectivity, friendliness, cooperativeness, interest in and tolerance of other people. On the other hand, the personality of the low perceiver was described as self-involved, suspicious of others, hypercritical, hostile, and oversensitive.

On the strength of Baker's findings (4), a related study was conducted by Arena and Murphy (3). With the intention of substantiating Baker's findings (4) by adding an independent population, experimental conditions were duplicated with the single exception of exclusion of the condition of high mental set which was considered an unnecessary complication to the design, since its effect had already been shown not to alter the data (4). The low mental set condition corresponded to the usual instructions given for work with the trapezoid and was, therefore, the set condition chosen for this research. Forty female undergraduates between 18 and 22 years of age were tested, viewing the luminous rotating target at distances of seven and 14 feet in a totally dark room. No significant relationships were observed between the number of reversals perceived and any of the Guilford-Zimmerman subscale scores. The present study, therefore, was initiated in an attempt to resolve the apparent contradiction between the findings of these two studies by providing additional data from a completely independent sample under an exact replication of Baker's experimental design and conditions (4).

B. Apparatus and Procedure

The trapezoidal target was a figure 13.25 inches in length, with a long and short edge respectively of 13 and nine inches. It contained six windows, in two rows of three windows each. This was driven by a constant speed motor at the rate of 35 rotations per minute. The target was coated with luminous paint and charged by rotating it for one minute under direct illumination of a 100-watt bulb placed at a distance of 10 inches from it. Viewing followed in a totally darkened room with subjects who had undergone a 10-minute period of dark adaption. The target was viewed at distances of seven and 14 feet with the subjects recording each perceived reversal by pressing the tabulation button of a mechanical hand counter.

Fifty female undergraduates between 18 and 21 years of age served as subjects. All had normal vision or wore corrective lenses during testing. Subjects were individually tested four different times, twice at seven and 14 feet, under the condition of low mental set, and twice at seven and 14 feet, under the condition of high mental set. The instructions inducing these conditions of mental set were taken exactly from Baker (4). Each of the four sessions consisted of five three-minute viewing trials, separated by one-minute rest periods. The first three-minute viewing trial in each of the four sessions was considered a practise or warm-up trial and was excluded from the final data. Thus, the number of reversals perceived for each viewing session was based upon the last four three-minute viewing trials, again following Baker's design (4). The Guilford-Zimmerman Temperament Survey was administered to each subject at a fifth experimental meeting. Rank-order correlations were computed to determine the extent of the relationship, if any, between the personality variables measured by the Guilford-Zimmerman subtest scores and perceptual performance as measured by the total number of reversals perceived by the subjects during the four viewing sessions. Again, as in Baker's study (4), the data from the four sessions were combined because no significant chi square differences were observed in the number of reversals perceived under conditions of high mental set as opposed to conditions of low mental set.

C. RESULTS AND DISCUSSION

Table 1 presented the correlation coefficients between subtest scores on the Guilford-Zimmerman Temperament Survey and the total number of reversals perceived by the subjects in the present study. Also included in Table 1 were the comparable data from Baker's study (4) and from the research of Arena and Murphy (3).

TABLE 1
RANK ORDER CORRELATIONS BETWEEN GUILFORD-ZIMMERMAN SUBSCALE SCORES AND THE TOTAL NUMBER OF REVERSALS PERCEIVED FOR 50 SUBJECTS IN THE PRESENT STUDY, FOR 48 SUBJECTS IN BAKER'S STUDY AND FOR 40 SUBJECTS IN THE ARENA AND MURPHY DATA

G-Z subscales	Present study	Baker's study	Arena & Murphy
General Activity	.12	—.17	—.06
Restraint	.04	—.12	.16
Ascendance	.28*	—.07	.18
Sociability	.08	.21	.13
Emotional Stability	—.19	.27	.13
Objectivity	—.24	.41*	.13
Friendliness	.09	.44*	.04
Thoughtfulness	.11	—.01	.10
Personal Relations	.17	.69*	.23

* $p = .05$.

As already noted, Baker's data (4) revealed three significant positive correlations between the Guilford-Zimmerman subscale scores of Friendliness, Objectivity, and Personal Relations and the number of reversals perceived on the Ames Rotating Trapezoid. These correlations formed the basis of Baker's distinction (4) between the personality of the high perceiver and that of the low perceiver. In the data presented in Table 1, neither the correlations obtained in the present study nor those appearing in the Arena and Murphy data (3) offered support of Baker's findings (4). In fact, it should be noted, with regard to the correlation between the number of reversals perceived and scores obtained on the Objectivity subscale, that the present data showed a trend in the negative or opposite direction from that in which Baker (4) found significance.

It was also evident from Table 1 that, with the single exception of the Ascendance subscale in the present data, none of the Guilford-Zimmerman subscale scores correlated significantly with the number of reversals perceived in either the data of Arena and Murphy (3), or in that of the present study.

The positive correlation between the number of reversals perceived on the rotating trapezoid and the scores obtained on the Ascendancy subscale in the present study just attained significance at the .05 level. Viewed in isolation, this correlation suggested that the high perceiver might present a more outgoing, talkative, and leadership-oriented personality than would the low perceiver. However, considered in context of the two independent sets of correlations presented by Baker (4) and Arena and Murphy (3), neither of which offered any support for this finding, it would seem prudent to withhold judgment concerning the meaningfulness of this relationship until further evidence is available.

The nonsignificant correlations in Table 1 were not altogether unexpected after some of the studies involving the trapezoidal illusion had been examined. Individual data presented in the work of Cappone (6), Zegers and Murray (19), and Malone (12) revealed the variability of several scores from session to session for the same individual. The importance of practise as a stabilizing factor has been alternatively confirmed (12) and denied (4, 6) until Cappone's most recent research (7) which indicated that, even after prolonged exposure of 20 hours of viewing, complete stability had not been attained by all subjects although a practise effect was observed—a fact certainly well worth noting in the interpretation of any data involving the Ames Illusion. Finally, it should be noted that a large part of the literature (1, 14, 15) concerned with the perception of the Trapezoidal Illusion pointed to past experience and individual expectancies as important variables. The subjects for these studies were drawn from three different colleges, one in an entirely different section of the country, and represented different socioeconomic backgrounds. This fact alone, in terms of experiential and attitudinal factors, could have accounted for much of the variability observed between the three sets of correlations.

A final possibility concerning the discrepancy between Baker's findings (4) and those of the present study and of Arena and Murphy's research (3), centered around suggestion and prestige factors. Day and Power (8) noted the effect of instructions upon perception of the trapezoidal illusion. Since no significant differences were apparent between the number of reversals perceived under the condition of high mental set and that of low mental set both in Baker's study and the present research, it could be assumed that the two sets of instructions resulted in a single subjective set for each of those participating in the experiment. McGee (13) and Cappone (6) both noted the direct effect of suggestion on perceptual performance on the Ames Illusion. Further, Cappone (6) indicated that the force of the suggestion effect upon the perception of the illusion was related to the prestige position of the experimenter in regard to his subjects. Thus, the fact that Baker's subjects (4), college undergraduates, were also his students could only have intensified the force of any suggestion or set he might have attempted. In view of this, it was not surprising that in Baker's study (4) the high perceivers, or subjects who "took" the suggested direction of perceiving, were also high scorers on subscales measuring submission, cooperation, and friendliness. Nor was it strange that the low perceivers, or subjects who resisted the illusion and the suggestion, should be characterized by their Guilford-Zimmerman performance as suspicious, hypercritical, and hostile. On the other hand, although strongly enforced by a prestige figure in a teacher relationship to herself and her subjects, the examiner who conducted the present experiment was still simply an advanced student. Her relationship to her subjects was that of a peer rather than that of a teacher or of a superior. Thus, she was in a far less favorable position to impose suggestion or set upon her subjects. The same situation occurred in the Arena and Murphy research (3). From this, it seemed possible to conclude that, in general, no significant correlations existed between perceptual performance on the Ames Rotating Trapezoid and personality variables measured by the Guilford-Zimmerman Temperament Survey. However, there was a strong possibility that such relationships might appear or develop as a function of suggestion in general and of examiner-subject interaction in particular.

D. Summary and Conclusions

The present study represented an attempt to resolve differences on the data of Baker (4) and that of Arena and Murphy (3) concerning the possible relationship of personality variables as measured by the Guilford-Zimmerman Temperament Survey and perception of the Ames Trapezoidal Illusion. Fifty female college subjects were tested under conditions closely reproducing those used by Baker (4) in his initial study.

Rank-order correlations obtained between scores on the Guilford-Zimmerman subscales and the number of reversals perceived when viewing the Ames Rotating Trapezoid agreed with those of Arena and Murphy (3) in offering no support for the significant correlations obtained by Baker (4) with regard to the Friendliness, Objectivity, and Personal Relations subtests.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 99-105.

THE RELATIONSHIP OF PSYCHOMETRICALLY DETERMINED PERSONALITY VARIABLES TO PERCEPTION OF THE AMES TRAPEZOIDAL ILLUSION. II*

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A. INTRODUCTION

Since its development in 1957, the California Psychological Inventory has become an increasingly popular personality inventory and research tool. For example, two recent studies in the area of visual illusion have given this test a central position in batteries designed to identify and measure possible personality variables involved in perceptual performance.

The first of these was a study by Crutchfield (3), whose data pointed to personality differences as measured by scores on the California Psychological Inventory, the word rearrangement test, the insight puzzle test, and the concept mastery test of Terman between high and low susceptibility to the size-weight illusion. Degree of illusion susceptibility was negatively correlated with scores obtained on the California Psychological Inventory subscales of Intellectual Efficiency and Achievement through Conformity. This suggested that the personality of the individual minimally affected by illusion-producing situations was characterized by such favorable traits as responsibility, dependability, and efficiency, and that the individual was energetic, good natured, and self-confident. On the other hand, individuals highly susceptible to illusion were described as awkward and tense, opinionated and headstrong, stubborn and talkative. On the assumption that illusion susceptibility was a broad trait, Crutchfield (3) extended his research to include findings on the Gottschald Figures Test in his picture of the illusion-resistant and illusion-susceptible individuals. Thus, the illusion-susceptible personality was further characterized as intellectually limited, narrow, and pedantic, while the illusion-resistant personality was described as introspective, socially perceptive, and intellectually vigorous.

McGurk (5) also utilized the California Psychological Inventory as one

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* Received in the Editorial Office, Provincetown, Massachusetts, on June 6, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] The author wishes to express her sincere gratitude to Dr. M. L. LaDriere and Dr. M. K. Cappone for their guidance and advice during the course of this research.

of a battery of tests (also including the Adjective Check List, Self-Rating Data, and Biographical Data) in an attempt to describe specifically the characteristics of the illusion-resistant individual. Illusion resistance was measured by scores obtained on a five-alternative multiple-choice scale of 22 empirically selected geometric visual illusions and on a ten-item perceptual-accuracy test. McGurk hypothesized that significant positive relationships existed between scores on the California Psychological Inventory subscales of Dominance, Capacity for Status, Self-Control, Achievement through Independence, Flexibility, and Intellectual Efficiency. Her sample included 87 college undergraduates, 58 female and 29 male. Her data revealed significant positive correlations between degree of resistance to illusion and scores on the California Psychological Inventory subscales of Self-Control, Achievement through Conformity, Achievement through Independence, and Psychological Mindedness for the female subgroup. In the data for the male subgroup, only one significant correlation appeared, that between scores on the Femininity subscale and degree of resistance to illusory cues. Also, significant correlations were obtained on the data of the whole group between scores on the Perceptual Accuracy test and those on the California Psychological Inventory subscales of Tolerance, Good Impression, Achievement through Independence, and Intellectual Efficiency. Further analysis on the basis of sex revealed only one significant correlation, that between scores on the Good Impression subscale of the California Psychological Inventory and performance on the Perceptual Accuracy test in the data of the male subgroup. McGurk (5) concluded that the illusion-resistant person may be described as adaptable, free from impulsiveness and self-centeredness, insightful, responsive to the needs of others, and possessing strong needs for achievement. Data from the Adjective Check List test rounded out this picture in that it appeared that the illusion-resistant person is dominant without aggression and affiliative without personal involvement. It was the purpose of the present study to elaborate upon the work of Crutchfield (3) and of McGurk (5) by extending the illusory material beyond the simple static visual targets used by these authors to a moving illusory target. This represented an attempt to determine how broad the application of the relationships described in these studies might be.

B. APPARATUS AND PROCEDURE

The Ames Rotating Trapezoid constituted the illusion-producing stimulus, and scores on the California Psychological Inventory served to measure the personality variables to be considered. Experimental design and viewing procedure for the trapezoidal target are fully described by Stoegbauer (6). The

California Psychological Inventory was administered to the 50 female college undergraduates serving as subjects in a separate experimental session. Rank order correlations were computed between the total number reversals perceived in viewing the Ames Trapezoidal target during four experimental sessions and scores obtained on the California Psychological Inventory.

C. Results and Discussion

The rank order correlations obtained between scores on the California Psychological Inventory subscales and the number of reversals perceived on the Ames Rotating Trapezoid for 50 female undergraduate subjects are presented in Table 1. Also included are the R_2 and E_1 sets of comparable correlations between California Psychological Inventory subscale scores, performance on the test of illusion resistance drawn from the data of McGurk's female popu-

TABLE 1

Rank Order Correlations Between the California Psychological Inventory Subscale Scores and the Total Number of Reversals Perceived for the 50 Female Subjects on the Ames Rotating Trapezoid and Correlations Obtained Between California Psychological Inventory Subscale Scores and Performance R_2 and E_1 Forms of McGurk's Illusion-Resistance Test for 58 Female Subjects

CPI Subscales	Green	McGurk R_2	McGurk E_1
Dominance	.32*	—.05	—.17
Capacity for Status	.01	.23	.00
Sociability	.10	.04	—.06
Social Presence	—.18	.07	.00
Self-Acceptance	.05	—.03	.15
Sense of Well-being	.11	.23	.16
Responsibility	.19	.23	.17
Socialization	.25	.08	.11
Self-Control	.02	.27*	.23
Tolerance	.26	.19	.18
Good Impression	.12	.15	.15
Communality	—.11	.10	.11
Achievement through Conformity	.23	.25*	.22
Achievement through Independence	.06	.29*	.31*
Intellectual Efficiency	.07	.17	.24
Psychological Mindedness	.10	.33*	.33*
Flexibility	.10	.20	.24
Femininity	.37*	.10	.10

* $p = .05$.

lation (5).[2] It should be noted that no significant difference appeared between the Mean California Psychological Inventory subscale scores of McGurk's study (5) and those of the sample used in the present study; thus, the comparability of the California Psychological Inventory data seemed established.

In order to avoid confusion, it should be noted from the outset that, while McGurk's illusion-resistant individual (5) was a high scorer on her test of illusion resistance, this same individual would be a low perceiver of the Ames Trapezoidal Illusion. The same was true of McGurk's illusion-susceptible individual (5), since that individual would score low in correct responses on the illusion-resistance test, but high in the number of reversals perceived in viewing the rotating trapezoid. Thus, positive correlations in McGurk's study (5) agreed in direction with negative correlations computed from the data of the present study and *vice versa.*

With this in mind, it was evident from the data presented in Table 1 that very little agreement existed between the two sets of data. McGurk (5) obtained significant correlations between resistance to illusion and scores on the California Psychological Inventory subscales of Self-Control, Achievement through Conformity, Achievement through Independence, and Psychological Mindedness. This was in partial agreement with the findings of Crutchfield (3), whose illusion-resistant population scored high on California Psychological Inventory subtests Achievement through Conformity, Achievement through Independence, Intellectual Efficiency, and Tolerance. No such relationships appeared in the data of the present research.

Only two relationships attained significance in the present study, neither of which approximated significance in either McGurk's or Crutchfield's work (3, 5). The first of these was the significant positive correlation between scores on the Dominance subscale and the number of reversals perceived on the Ames Trapezoid. This suggested that the illusion-susceptible individual tended to be more persistent, aggressive, independent, and outgoing than the illusion-resistant person. Also, the illusion-susceptible person in this respect possessed more leadership potential than the low perceiver. Some support of this finding appeared in the significant positive correlation obtained by Stoegbauer (6) between scores on the Guilford-Zimmerman Ascendancy subtest and the number of reversals perceived in viewing the Ames Rotating Trapezoid. McGurk's correlations (5) with regard to her female population on the Dominance subtest were negative, suggesting the same direction of relationship: i.e., that the illusion-resistant individual was retiring rather than dominant. She found a significant correlation between degree of resistance to illusion and scores on Adjective Check List Dominance subscale, however, and explained this in terms of dominance without the aggression which was implied in the California Psychological Inventory Dominance subtest scores. However, the apparent correlation of California Psychological Inventory Dominance scores with illusion susceptibility in the present data was contradictory to both the work of McGurk (5) and of Crutchfield (3), both of which postulated the illusion-resistant individual to be more independent, self-confident, and dominant than the illusion-susceptible person.

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[2] Some confusion might result if it were not explained that in McGurk's development of her test of illusion resistance, 37 visual geometric illusions were administered to a pilot group. From these, 22 items were selected on the basis of their high correlation with the total test scores and low correlation with the nonillusion or perceptual accuracy test. This constituted the R_2 test used in her study. A second 22-item scale was developed in the process of applying "semiempirical" weights based upon performance on the 37-item original test, to each of the items included. This was the E_1 test used in her study.

The second correlation to achieve significance in the data of the present study was that between the California Psychological Inventory subtest Femininity scores and the number of reversals perceived on the rotating trapezoid. This suggested that the illusion-resistant individual was ambitious, hardheaded, blunt, and opportunistic, while the illusion-susceptible person was persevering, accepting of others, and conscientious. McGurk's data (5) for her female population showed no such relationship. However, the data, E_1, of her male population presented a significant positive correlation of .39 between the scores on the subscale and resistance to illusion. This implied that illusion-resistant males in the McGurk research (5) were patient and accepting of others, while illusion-susceptible females in the present study showed the same characteristics. Thus, with regard to performance on the California Psychological Inventory subscales, it appeared that similar illusion susceptibility between the sexes is mediated by opposing personality traits. Of course, all of this was tentative, and the apparent discrepancy could be allied merely to differences in the illusory task. The possibility of different basic perceptual processes operating between the sexes, nevertheless, cannot go unmentioned, especially since Malone's data (4) showed a significant difference between male and female in the perception of oscillation.

The data of the present study failed to lend support to the findings of either Crutchfield (3) or of McGurk (5). It should be further noted that Baker's findings (1) presented a picture of the illusion-resistant personality as hostile, hypercritical, and suspicious of others. This position was in contradiction to that of McGurk (5) and Crutchfield (3), both of whom described the illusion-resistant individual as adaptable, good natured, and responsive to the needs of others. Still further, Witkin (7) found that the field-independent personality was more active and independent, less impulsive and better motivated to achieve than the field-dependent individual. However, Witkin (7) also noted that illusion-resistant individuals were overcontrolled, cold, distant, and unpopular, preferring little contact with people and unaware of their own social stimulus value. This description was reminiscent of Baker's low perceiver (1). It also fitted with the Femininity correlation in the present research described above, since here the illusion-resistant individual was described as opportunistic and manipulative in dealing with others, active, and impatient of delay. Generally, it would seem that there was much more contradiction than agreement as to the specific personality variables underlying susceptibility to illusory experiences. It was probable that part of this disagreement was due to overlap and interaction among the tests and subtests used to define the critical personality variables. It was also possible that susceptibility to illusory experience was a more restricted trait than Crutchfield's research (3) led one to suppose. This possibility was supported by Malone's data (4) in which no significant correlations were obtained between responses to different targets usually productive of illusion. If illusion susceptibility were relatively stimulus-dependent, this might have implied involvement of different mediating perceptual mechanisms and would certainly have contributed to the discrepancies observed in the literature. Also, Cappone's data (2) suggesting that perceptual behavior was closely allied to stage of practise and was highly susceptible to change could have explained apparent inconsistencies between the data. The small number of cases in each of these studies could also have been a contributing factor in the inconsistencies found. In conclusion, it would appear the present data available have not yet reached the stage where it would be possible to define the critical personality parameters underlying perceptual responses to visual illusions.

D. Summary and Conclusion

It was the purpose of the present study to elaborate upon the work of Crutchfield (3) and of McGurk (5) by extending the range of viewing to include moving as well as static targets. The Ames Rotating Trapezoid constituted the stimulus used to elicit perception of illusion, and scores on the California Psychological Inventory served to measure the personality variables to be considered. Fifty female college undergraduates served as subjects. Rank order correlations between scores on the California Psychological Inventory subscales and number of reversals perceived when viewing the Ames Rotating Trapezoid were computed and compared with the findings of Crutchfield (3) and McGurk (5).

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 107-126.

CHILDREN'S LATERALIZATIONS OF HUMAN FIGURES: ANALYSIS OF A DEVELOPMENTAL TRANSITION* [1]

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A. INTRODUCTION

The present study grew out of attempting to resolve the following question: which side of a frontal, two-dimensional self-likeness do children spontaneously consider to refer to the right and left, respectively, of their real body? That is, do children lateralize such figures as though they were mirror-like *reflections* of themselves (in which case corresponding body parts would be located *directly opposite* their own), or do they *transpose orientations,* so that they consider the right (or left) side of their real body to correspond to the side that is *diagonally across* (rather than directly opposite) from it in the replica? Unlike situations wherein one is faced by *another person,* a little deliberation will make it apparent that no pervasive perceptual or logical grounds exist for preferring either type of lateralization in relation to a face-on representation of the *self*. It is valid to think of such self-images as being *unreversed*—as they would appear in a mirror; it is equally cogent to view them as though their sides were reversals of the self—as in a photograph. Both types of self-representation are encountered by children who live in environments where mirrors, photographs, and other kinds of self-images are commonly seen.

The writer's interest in the question posed stems from a series of investigations undertaken to explore children's conceptions of their bodily characteristics (6, 7, 8, 10).

B. THE SELF-DRAWING TEST

In order to determine whether children lateralize self-replicas from the focus of the person being portrayed or from that of the observer, the following procedure was devised.

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* Recommended by Arthur T. Jersild of the Editorial Board of *The Journal of Genetic Psychology* and *Genetic Psychology Monographs,* and received in the Editorial Office, Provincetown, Massachusetts, on June 7, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This research has been supported by grants from the United States Public Health Service, National Institutes of Health (MH-11937), and from the Association for the Aid of Crippled Children. Portions (9) of this paper were presented at the 1965 meeting of the Society for Research in Child Development. The author is indebted to Dr. Jacob Cohen for statistical consultation, and to Joan Stern Girgus for her assistance with many aspects of the study.

1. *Method*

S was seated and given an 8½-inch × 11-inch sheet of paper and a pencil. *E* said, "Draw a picture of yourself . . . . Draw it standing up and facing frontwards."[2] *E* noted and recorded whether *S* was right- or left-handed. When the drawing was completed, *E* pointed to it and said, "Suppose this is a picture of you—and it really *is* a picture of you—show me which hand you, *in the picture,* would use to make a drawing. Point to the hand that would hold the pencil." (This procedure was used rather than asking *S* to indicate right and left on his body, as well as on the drawing, in order to control for inability to identify right and left, *per se.*) If *S* pointed to the pictured hand that was *directly opposite* the real hand he had used, his response was recorded as Mirror-Image Designation; if he indicated the pictured hand that was *diagonally across* from the real hand used, his response was recorded as Diagonal Designation.

It was assumed that those who responded with *mirror-image designations* identified corresponding body parts on themselves and on their self-drawings as though these were *reflections* of one another, whereas *diagonal designators* identified them as though the sides of their actual person and of the drawn figure were *reversed* as in a photograph.

The children proved remarkably self-consistent in the type of lateralization made on this test. In evidence, of 25 subjects (between ages 5.2 years and 11.7 years) who were retested within a month, all gave the same designations on both occasions.

2. *Subjects*

The foregoing procedure, to be referred to as the Self-Drawing Test, was administered individually to 388 "normal" boys and girls ranging in age from 5.2 years to 12.9 years. The children, who attended a public school in New York City, represented a broad range of sociocultural backgrounds. Most came from lower-middle and lower-class families. In ethnic origin, about 38 per cent were Jewish, 15 per cent Continental Negro, 15 per cent North European Protestant and Catholic, 13 per cent Italian, and 10 per cent Puerto Rican. Their mean *IQ* was 108, the range extending from 79 to 168. For the entire sample, no significant sex differences in mean *IQ* were found.[3] Fourteen per cent were left-handed.[4]

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[2] The entire instructions were "Draw a picture of yourself wearing a bathing suit. Draw it standing up and facing frontwards. Tell me when you are finished." This procedure was used so that the drawings also might be used for studies exploring aspects of the body percept to be reported elsewhere.

[3] For most subjects, group *IQ* scores (Otis Quick-Scoring Mental Abilities Test, or Pintner-Cunningham Primary Test) were available from the school records. The

3. *Findings*

On the Self-Drawing Test, 43 per cent gave mirror-image designations—that is, they lateralized self-images as though these were *reflections* of themselves; whereas 57 per cent responded with diagonal designations—that is, they pointed to the pictured hand located *diagonally across* from the real hand used in the drawing. For all age groups combined, percentage of mirror-image designations was almost identical per sex. Thus, for the sample taken as a whole, no marked preference for making either mirror-image or diagonally oriented lateralizations was found.

Is there any way, then, to predict which type of designation a given child may use?

When the subjects' designations were plotted along an age gradient, it became apparent that there was a positive association between type of designation used and chronological age. Figure 1 presents this regression, per sex, in terms of per cent diagonal designations. It shows that mirror-image designations predominated in the younger groups. With increasing age, a shift occurred, so that by age 9.8 years, less than one-third of the children made mirror-image designations. This percentage dropped further to below 20 per cent for the groups whose mean age was 11.9 years. Thus, while 5-year-olds characteristically lateralized self-images as though they were reflections, those beyond age 9 tended to lateralize diagonally. The correlations between age and diagonal designation were .55 among boys and .34 for girls. The significance ($p < .01$) of the sex difference between these coefficients was primarily due to the performance of the 5-6-year-olds. Correlations omitting these children were .36 and .30 for boys and girls, respectively ($p < .01$, two-tailed tests, for all correlations reported above).

What accounts for the observed shift, with age, from mirror image to diagonally oriented lateralization of self-images?

While testing the children, the investigators noticed that some subjects literally or verbally turned themselves around, so that they were facing the same way as their drawing, before they would indicate which hand in the picture

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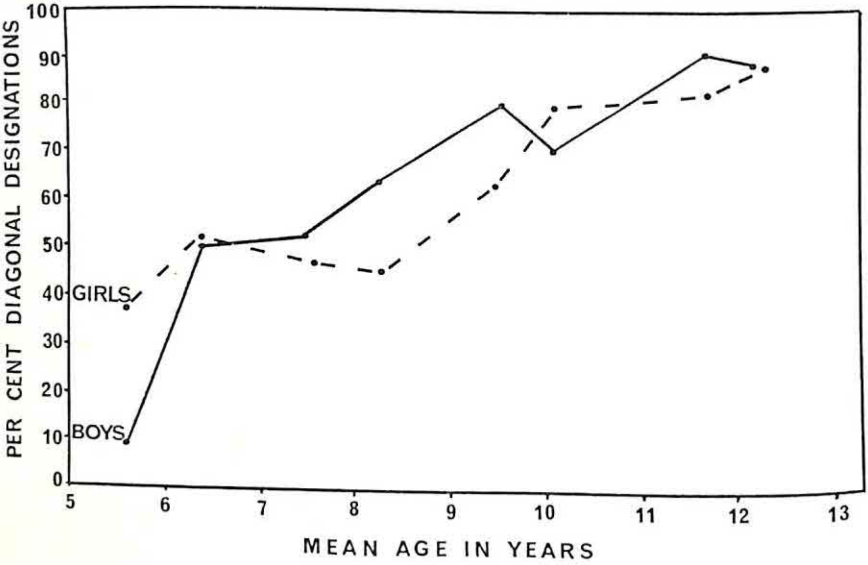
group *IQ*s of children with foreign language backgrounds have been deleted. The group *IQ*s revealed no significant sex differences in mean intelligence. However, on Goodenough's Drawing Test of Intelligence (11), the girls' mean *IQ*s were significantly above those of the boys. This again confirms the frequently reported (13) finding that the Drawing Test of Intelligence is biased in favor of girls.

[4] This is the same proportion of left-handed children Belmont and Birch (1) reported in a recent study. The fact that both studies found a somewhat higher incidence of left-handedness than is generally reported suggests that this characteristic might be on the increase—perhaps as a function of current educational practices regarding handedness.

corresponded to the one they had used in making the drawing. This implied that at least some children thought of the drawing as though it were oriented comparably to another person facing them, rather than as a reflection. If this conception were predominant, the findings might be explained on the basis of some observations reported by Piaget (16), Benton (2), and others. Piaget found that ". . . it is only at the age of 8 that the child is able to place himself (in imagination) at the point of view of others with regard to the left and right . . ." (p. 109). Both he and Benton noted the young child's tendency to use his own "egocentric" locus as a universal reference point. They accounted for their observations in terms of the young child's inability to think of spatial relations in relativistic terms. Thus, if children generally conceived of an *en face* self-image in the same way as of another person facing them, the observed shift with age, on self-drawings, from mirror image to diagonal designations might be explained on the following basis: that an increasing proportion of subjects either have mastered the general principle of transposing orientations or at least have learned a specific rule, such as "the



N PER GROUP:	BOYS	43	22	42	17	27	7	22	18
	GIRLS	43	29	30	13	25	5	29	16

FIGURE 1
PER CENT DIAGONAL DESIGNATIONS IN SELF-DRAWINGS BY AGE AND SEX

corresponding hand of any figure facing you is diagonally across from your own."

The foregoing line of reasoning can be stated in terms of the following hypotheses:

1. The older the child, the more likely is he to be able to "transpose" spatial relationships, so that he can correctly identify *right* and *left* on other people regardless of their position. Thus, the older the child, the more likely is he to lateralize diagonally figures of others which are facing him.

2. If frontal self-representations are conceived of as though they were oriented like another person facing the subject, the same kind of lateralization should be made for both kinds of stimuli. That is, a subject either should respond consistently with mirror-image designations when confronted both with self- and with nonself-figures, or he should make diagonally oriented designations in lateralizing both kinds of figures. Moreover, since the ability to transpose points of reference improves with age, per cent diagonal designations should rise with increasing maturity, both for self-image lateralizations and for frontal-nonself figures. The magnitude of this increase should be the same in response to self-representations as to nonself-figures.

C. THE RIGHT-LEFT-DESIGNATION TEST

In order to test the preceding hypotheses, it was necessary to find out which subjects were able to lateralize relativistically. The following procedure, named the Right-Left-Designation Test, was devised to ascertain this by determining whether subjects were able to transpose viewpoints or—to put it less inferentially—whether they were able to make diagonal designations when such a response was clearly the correct one.

1. *Method*

S was seated, asked to put his hands on a table before him, and to shut his eyes. Then he was instructed to raise his *right* hand. When he had raised *either* hand and then replaced it on the table, he was asked to raise his *left* hand. Both responses were recorded.[5] This part of the test was carried out with *S*'s eyes closed in order to prevent the use of visual cues (such as watches, rings, and so forth) for right-left identification. Next, a 4½-inch × 2½-inch photograph of an adult was stood directly in front of *S*. The figure in the photograph was posed with arms slightly extended, standing up and facing the camera. Pictures of adults whose sex was opposite to that of *S* were used as stimulus figures in order to minimize the likelihood that the child might identify the photograph with his own person. *S* was asked to point to the right and left hands, respectively, on the photographed figure. If he pointed to the hand that was directly across from his own correspondingly identified hand, his response was recorded as *mirror image*. Conversely, pointing to the hand located diagonally across from his own, was termed a *diagonal* response. Two trials of this test were given per *S*, and a third was added whenever responses on the first two trials differed from each other. In such cases (13 per cent of the total sample), the responses obtained in two out of three trials were considered *S*'s predominant pattern.

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[5] None of the subjects raised the *same* hand to refer to his own right, as well as to his left, although some misidentified both sides. Thirteen per cent manifested at least some confusion in identifying their own right and left hands. Only one of these children was more than 7.8 years old, and this boy's comprehension of English was below average.

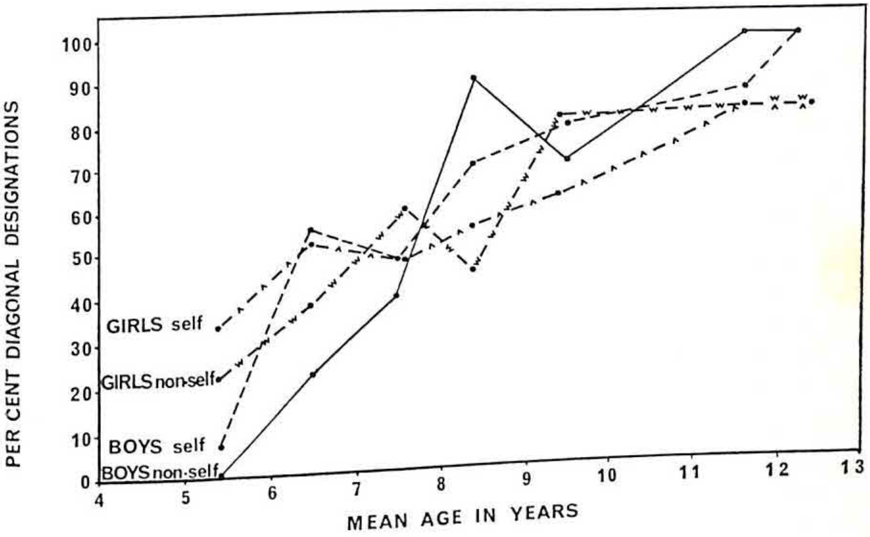
2. *Subjects*

Two hundred and forty-six subjects, drawn from the entire age range of the previous sample, were given both the Self-Drawing Test and the Right-Left-Designation Test.

3. *Findings*

On the Right-Left-Designation Test—that is, in response to the nonself-figure—40 per cent gave diagonal designations.

In Figure 2, per cent diagonal designations on the nonself-photographs (as well as on the Self-Drawing Test), are graphed according to age and sex. The unbroken line represents boys' and the line interspersed with w's represents girls' lateralizations of nonself-figures. In accord with expectations, per cent diagonal designations on this test increased significantly with age. (This developmental regression still obtained when per cent diagonal designation was plotted along age and the only subjects used were those who correctly identified their own right and left hands.) As in the Self-Drawing Test, the above relationship was significantly ($p < .01$) more pronounced among boys than among girls ($r_{\text{boys}} = .70$, $p < .005$; $r_{\text{girls}} = .41$, $p < .005$; two-tailed tests). Figure 2 shows that the present data agree fairly well with Piaget's (16, p. 108) observations regarding the age (8 years) at which 75 per cent should be able to lateralize from the point of view of another person facing them. [Belmont and Birch's (1) intellectually high subjects attained this level of proficiency by age 7 years.] However, on the basis of the reported data, an assertion made by Machover (15, p. 88) that, for most subjects, the right and left of a drawn figure are oriented from the focus of the person being portrayed, must be restricted to individuals beyond age 9. According to Benton (2, p. 100), even 25 per cent of adult subjects occasionally made mirror-image lateralizations when asked to identify right and left body parts on a person who was facing them.



N PER GROUP(a) :	BOYS	30	18	33	10	14	16	8
	GIRLS	27	21	25	9	16	12	6

FIGURE 2

PER CENT DIAGONAL DESIGNATIONS ON SELF AND NONSELF-DRAWINGS BY AGE AND SEX

[a] One boy was not included in the graph because he was the only case falling into the age-interval 10-11 years.

D. COMPARISON OF LATERALIZATION ON SELF- AND NONSELF-FIGURES

1. *Consistent Treatments*

The results of the Right-Left-Designation Test permitted examination of the hypothesis that the observed shift, with age, from mirror-image designation to diagonal designation in lateralizing self-images was a function of an age-associated increase in ability to transpose orientations and to "decenter" one's viewpoint. As suggested, if subjects considered self-drawings to be oriented like other persons, those who made diagonal designations on the Right-Left-Designation Test (i.e., when faced by a figure representing someone other than themselves), also should have lateralized their self-drawings diagonally. Comparing the regressions of diagonal responses on self-replicas with those for nonself-figures (see Figure 2) supports this supposition, and the data presented in Table 1 clearly confirm it. For the sample taken as a whole, 83 per cent of those who made diagonal designations on the nonself-figure also lateralized the self diagonally. Similarly, 76 per cent who lateralized the nonself-figure in mirror-image fashion (thereby indicating an inability to transpose orientations in the present context) also gave mirror-image designations in relation to their self-drawings. These results greatly exceed the agreement between designations on the self-drawings and on the nonself-figures that might be expected by chance ($\chi^2 = 84.87$, $df = 1$, $p < .001$).

The preceding results confirm the hypothesis that most children conceive of *en face* drawings as though they were oriented like another person facing them. In recapitulation, this conclusion is drawn from the following observations: (*a*) frontal representations of self and nonself usually were lateralized identically; and (*b*) when children were able to transpose orientations correctly (i.e., by designating diagonally) on the nonself-figure, most of them also made diagonal designations on the self-drawings.

It is possible that making diagonally oriented lateralizations in response to any figure one is confronted with—regardless of its character or position—does not stem from relativistic thinking or from mastery of the general principle of transposition, but rather from the rigid activation of a specific rule or habit. This hypothesis derives support from the difficulty persons of all ages commonly encounter in matching body sides correctly when looking at reflections of themselves—for example, while attending to their grooming with the help of a mirror. (An elaboration of the present procedure would be required to distinguish clearly between subjects whose diagonal designations were based upon a special rule applied to a particular situation and those whose diagonal lateralizations resulted from genuinely relativistic conceptualization. For example, it would be interesting to compare how subjects lateralize figures whose back is facing them, or who are seen from a variety of orientations, with lateralizations made on a front-view figure. Dubanoski's (4) important investigation of children's lateralizations of letters, when these were traced on various parts of their heads, represents another aspect of the issue raised here.) If making diagonal designations on the photograph indeed were the result of relativistic thinking, it should be positively related to *IQ*—a measure that is partially derived from assessments of ability to conceptualize abstractly. Table 2 shows the extent to which this was the case. It will be seen that in every group the mean *IQ* of the diagonal responders exceeded the mean *IQ* of the mirror-image designators. The differences between the respective means were statistically significant for some groups and approached significance for the remainder. For the total sample, the correlation between *IQ*[6] and giving diagonal responses on the Right-Left-Designation Test was .20 ($p < .01$, two-tailed test). Thus, in some degree, intelligence, and by implication, relativistic thinking, were associated with making diagonal designations.

Along with lateralizing nonself-figures diagonally, making diagonal designations on the self-drawings also should have been correlated positively with *IQ*, since there was a high degree of correspondence in lateralizing self-replicas and nonself-figures. This expectation was confirmed, for the correlation of *IQ* and diagonal designation on the self-drawing also proved significant ($r = .13$, $p < .05$, two-tailed test). The correlations of *IQ* with nonself-designations, and of *IQ* with self-drawing designation did not differ significantly ($t_{\text{diff.bet.non-indep.rs}} = 1.31$, $df = 240$, $p > .05$), though the latter coefficient was the lesser of the two. (It is to be noted that in both total sample correlations cited, unlike the others, age is not controlled; correlations of designation with *mental age* undoubtedly would be substantially higher.) The present findings accord with Hammer's impression (12) that, in children, nonmirror-image lateralization of self-drawings is associated with high intelligence.

TABLE 2
MEAN INTELLIGENCE OF MIRROR-IMAGE RESPONDERS COMPARED TO MEAN INTELLIGENCE OF DIAGONAL RESPONDERS (NONSELF-FIGURES)

	Mirror-image responders			Diagonal responders					
Age in years	*N*	Mean *IQ*[a]	*SD*	*N*	Mean *IQ*[a]	*SD*	*t*	*p* of *t* (two-tailed tests)	r_{pb}[b]
5-6	78	98	14.1	18	104	9.3	1.80	$\leqslant .07$	.18
7-8	35	92	11.4	39	102	15.0	3.32	$< .01$	.37
9-10	8	91	12.3	23	100	13.0	1.62	$< .15$	.29
11-12	3	83	6.0	39	100	15.5	1.87	$< .09$	.28
All ages	124	96	13.5	119	101	14.0	3.30	$< .005$	.20

[a] Combined *IQ* score based upon mean score for all *IQ* tests available per *S*. The number of these tests, per individual, ranged from one to five. Types of tests: Otis Quick-Scoring Mental Abilities Test; Pintner-Cunningham Primary Test; Vocabulary test of the Stanford-Binet Intelligence Scale; Goodenough's Drawing Test of Intelligence. Three children for whom no valid *IQ* scores were available are omitted from this table.

[b] Correlation of *IQ* and diagonal designation.

It will be recalled that the question that occasioned the present study is "which side of a frontal, two-dimensional self-likeness do children spontaneously consider to refer to the right and left, respectively, of their real body?" It now has been shown that, taken as a group, boys and girls between the ages of 5 years and 13 years are about equally likely to consider *either* side of a self-replica to refer to their own right or left. However, for specific individuals, the mode of such lateralization can be predicted considerably beyond chance expectations by taking the following findings into account: (*a*) Particularly among boys, the older the child, the more likely is he to lateralize such stimuli diagonally. For both sexes, the majority so lateralize self-images by the age of 9 years. (*b*) Type of lateralization for self-replicas appears to be largely a function of being able to transpose orientations, in general. Thus, if an individual lateralizes diagonally in response to a figure of another person facing him, he is also very likely to make diagonal designations on self-images presented in corresponding orientation. (*c*) Finally, especially between ages 7 and 9 years, when most children shift to lateralizing frontal figures diagonally (see Table 2), the more intelligent the child, the more likely is he to lateralize self-images diagonally.

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[6] Pooled *IQ* scores. For derivation see footnote (a) Table 2.

2. *Contrary Treatments*

Although the correlation between lateralizations of the nonself-figures with those of the self-images was substantial ($r_\phi = .59$, $p < .005$, two-tailed test), 51 children, comprising 21 per cent of the sample so compared, did *not* lateralize the two figures *consistently,* but in *contrary* fashion, thereby making different designations in response to the self-replica as compared to the nonself-figure. Thus, for a sizable minority, self-images apparently were not considered to be in the same orientation as were pictures of other people. Since examination of behavior that deviates from predominant or predicted trends often provides clues regarding the processes under investigation, the contrary responders were subjected to further analysis.

Comparison of all consistent with all contrary responders yielded no notable differences between these two groups with respect to handedness, ethnic distribution, or language comprehension. Among children between ages 5 and 9, girls exceeded boys significantly ($\chi^2 = 3.9$, $df = 1$, $p < .05$) in the proportion who lateralized the two figures in contrary fashion. For males, proportion of contrary lateralizations was relatively constant from age to age, whereas the proportion of contrary responses among females decreased chronologically (see Table 1). Thus, some sex differences in the consistency of lateralization patterns were encountered. In mean (pooled) *IQ*, the contrary responders fell between the consistently mirror-image designators and the consistently diagonal designators, but did not differ significantly from either of these groups. With regard to mean age (see Table 3), the contrary response group was higher than the consistent mirror-image designators, but significantly below the consistently diagonal lateralizers ($t = 6.97$, $df = 149$, $p < .01$, two-tailed test). As shown in Figure 3, contrary responses virtually dropped out by age 11 years, thus suggesting that these were the result of "immature" cognitive functioning. The consistent and contrary response groups also differed from one another with respect to the percentage who manifested confusion when identifying their own right and left hands. The incidence of such confusion was significantly higher ($\chi^2 = 11.4$, $df = 1$, $p < .001$) among contrary responders than among the consistent lateralizers.

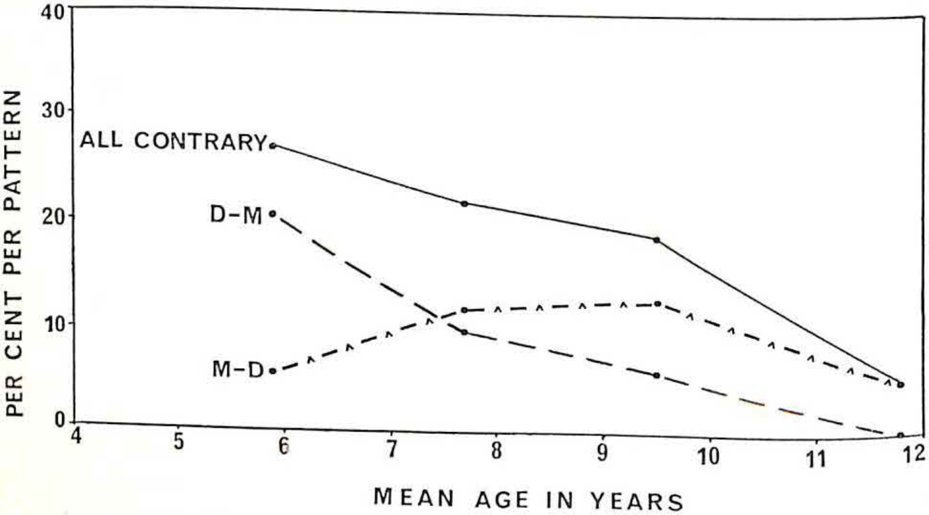

FIGURE 3

REGRESSION OF CONTRARY RESPONSE PATTERNS ON AGE (SEXES COMBINED); D-M: DIAGONAL ON SELF-DRAWING AND MIRROR IMAGE ON NONSELF ($N = 30$); M-D: MIRROR IMAGE ON SELF AND DIAGONAL ON NONSELF ($N = 21$); ALL CONTRARY: PATTERN D-M AND PATTERN M-D ($N = 51$)

The most apparent reason for lateralizing self-images in one manner and nonself-figures in another is that self-images are considered tantamount to a reflection, whereas those of others are not. In this case, the self-figure would be correctly lateralized in mirror-image fashion and the photograph, diagonally. This pattern will be referred to as the *M-D Pattern*. Of the 51 contrary designators, 21 followed this pattern. When 16 of these 21 children were retested after about one year, five still responded with "mirror image" to the Self-Drawing Test and with "diagonal" to the nonself-figure (see Table 4). Thirty cases manifested the converse pattern of making diagonal responses to the self-drawing, and mirror-image designations on the nonself-figure. (This pattern will be called the *D-M Pattern*.) Thus, the explanation suggested above cannot account for the majority of contrary responses obtained.

An alternative hypothesis regarding the reason for making contrary lateralizations on the two tests is that the contrary responders were in a transitional phase. In other words, such inconsistency might have been occasioned by the process of shifting from mirror-image to diagonal lateralizing of any frontal figures. If this were the case, (*a*) the average age of contrary responders should fall between that of consistent mirror-image responders (*Pattern M-M*) and that of consistent diagonal responders (*Pattern D-D*), and (*b*) contrary responders, in time, should become consistently diagonal responders. The available evidence pertinent to these expectations follows. In reference to the first criterion, Table 3 shows that the mean age of the contrary responders did exceed that of the consistent mirror-image responders and that it fell significantly below that of the consistent diagonal lateralizers as well. Thus, ranking designation patterns according to mean age supports the hypothesis that lateralizing self-images differently from nonself-figures is a function of being in a transitional phase of development. On the second point, if making contrary lateralizations is due to being in the process of transition, all contrary responders eventually should shift to Pattern D-D (i.e., consistently diagonal responses), since this is the typical mode at maturity. Of 36 contrary responders who were retested after about one year, 16 indeed shifted to making consistently diagonal designations on self-, as well as nonself-, figures. However, as shown in Table 4, this trend was not predominant. In fact, almost as many "reverted"

TABLE 4
RETEST LATERALIZATION PATTERNS OF CONTRARY RESPONDERS

Type of change	Pattern M-D[a] $N = 16$	Pattern D-M[b] $N = 20$	All contrary (M-D + D-M) $N = 36$
Unchanged	5	1	6
Changed to other contrary pattern	2	0	2
Retained contrary pattern (either D-M or M-D)	7	1	8
Changed to M-M[c]	5	7	12
Changed to D-D[d]	4	12	16
Changed to consistent pattern (either M-M or D-D)	9	19	28

[a] Mirror image on self-drawing and diagonal on nonself-figure.
[b] Diagonal on self-drawing and mirror image on nonself-figure.
[c] Mirror image on self-drawing and on nonself-figure.
[d] Diagonal on self-drawing and on nonself-figure.

to the presumably less mature pattern of lateralizing all human figures in mirror-image fashion (Pattern M-M). The longitudinal data do suggest that making contrary responses on the two tests usually was not a stable disposition, since the majority changed to a different pattern within a year. But longitudinal scrutiny of the contrary response group does not indicate that most of these subjects were in the process of becoming consistently *diagonal* responders. The small number of subjects retested, the relatively brief span (mean interval = 11.5 months) between test administrations per subject, and the lack of a comparable follow-up for consistent responders limit the confidence to be placed in the test-retest data. Nonetheless, the results exemplify the importance of "checking out" apparent developmental trends derived from cross-sectional sampling by following the salient behavior of the same individuals over an extended period.

In addition to the explanations offered thus far, some "spurious" contrary responses might have been due to faulty comprehension of the test instructions or to immature drawing skill.

Among the contrary responders, the following findings suggested that the Pattern M-D group differed in several respects from children presenting the D-M pattern:

1. As shown in Table 3 and Figure 3, the Pattern D-M children were significantly younger than the M-D responders. While mean ages for Pattern D-M and for Pattern M-M were identical, the M-D responders, on the average, were significantly older than both these groups (see Table 3).

2. While *none* of the 21 M-D responders misidentified his own right and left hands, 40 per cent of the D-M group made such mistakes. Thus, the children presenting the two types of contrary response patterns differed significantly from one another in the number of subjects who manifested confusion regarding their own right and left ($\chi^2 = 13.81$, $df = 1$, $p < .01$). The D-M responders also significantly exceeded their Pattern M-M agemates in this respect ($\chi^2 = 9.99$, $df = 1$, $p < .01$). (The incidence of right-left confusion per designation pattern was M-M = 13 per cent, D-M = 40 per cent, M-D = 0 per cent, D-D = 4 per cent.) These results suggest that the Pattern D-M contrary responses may have been *indirectly* related to age as a consequence of concomitantly immature conceptions of sidedness, in general. It seems less likely that this factor led to Pattern M-D responses.

3. As shown in Table 4, a further difference between the two contrary response groups was in the proportion who again lateralized self-images and nonself-figures disparately when they were retested about a year later. Whereas a substantial proportion of the M-D group still made contrary designations,

all but one of the Pattern D-M subjects had shifted to making consistent lateralizations. The difference between these two proportions is significant at the 6 per cent level (Fisher Exact Probability Test, two-tailed test). Thus, for some children, the Pattern M-D response may have been a rather stable disposition, whereas there was little indication of such constancy for the converse pattern group.

On the basis of the limited information available regarding factors that led to making disparate lateralizations on self-drawings as compared to nonself-figures, only very tentative conclusions seem warranted. They are summarized below.

1. No uniform determinant elicited contrary lateralizations. Rather, it seems likely that, for various subgroups, different factors accounted for the contrary response patterns manifested.
2. In some cases (44 per cent of Pattern M-D), contrary treatment of the self-images *versus* nonself-figures probably was due to a rather stable tendency to conceive of self-images as though these were reflections, even though the subjects knew how to transpose orientations (see Table 4).
3. However, for the majority, lateralizing in contrary fashion apparently was a *transitory*—but not necessarily *transitional*—mode which was followed sometimes by consistently making mirror-image designations, but more frequently, by consistently giving diagonal responses.
4. Making contrary responses tended to be associated with "immature" cognitive levels of development, since it occurred predominantly among the younger children sampled.
5. Children who were confused regarding their own right and left hands were significantly more likely to make disparate lateralizations on the two figures than were subjects who identified their own right and left correctly. This finding suggests that making contrary lateralizations is related to having a fluid or vague notion of sidedness—or perhaps no conception of sidedness at all. In this connection, it would be interesting to compare the performance of hemiplegics, who have lost awareness of one side of their body, with that of normal subjects on the two tests used in the present study. Furthermore, it must be remembered that labelling right and left relatively to the frontal aspect of persons and objects is a *learned convention* rather than an intrinsic property of such stimuli.
6. Finally, there was some indication that, particularly among younger children, girls were more likely to lateralize the two figures disparately than were boys. Although the investigator can offer no cogent explanation for such

a sex difference in performance, this finding should provide welcome support for some popular notions regarding female inconsistency!

The findings might have been clarified by asking contrary responders to account for the difference in the way they lateralized their self-drawing and the nonself-figure. However, due to young children's limited ability to explain their rationale, such a procedure would have been fraught with communication problems. It also might be fruitful to compare children's lateralizations of *real* self-reflections with their lateralizations of self-photographs, when both are comparably posed.

E. CONCLUSIONS AND DISCUSSION

Assuming the representativeness of the present sample, it has been shown that, without control of previous learning, elementary school children vary in lateralizing front-view figures of human beings. Investigators who use such material to study differential conceptions and attitudes regarding the two sides of the body should take such variations into account. Further, it has been demonstrated that the mirror-image or diagonal lateralization of human figures is not a matter of chance, but the result of a rather consistent individual disposition which is related to age, to the ability to imagine at least one other point of view, to intelligence, and to sex.

The exploration of the question that prompted this study led to the consideration of related problems with intriguing implications beyond the present context. Principally, these concern the mechanisms underlying the transposition of spatial relations. Among the issues encountered are the following:

1. What is the relation of learning particular rules (such as "the right hand of a person facing the self is diagonally across from one's own") to a pervasively relativistic approach to spatial frames of reference? Does the one precede, facilitate, or interfere with the other? And how is one to distinguish between the two?

2. Might differences in ability to make spatial transpositions be one aspect of a general cognitive style, such as Witkin *et al.*'s articulate-global dimension (17)—in addition to being related to intelligence and to sex?

3. What is the explanation for the significant sex differences found in the regression of diagonal designations on age? The present data are consistent with the hypothesis that females begin the transition from mirror-image to diagonal lateralization earlier than do males. Could this be a function of the superior language development of females frequently reported (14, p. 577) in early childhood? As suggested by Benton (2, p. 43), it is likely that lan-

guage facility enhances the capacity to use rules and to resort to verbal mediation. Such an advantage could be related to learning the transposition of viewpoints. Although this hypothesis is persuasive, it should be noted that no significant sex differences in language development were observed among the younger subjects sampled.[7] It would be valuable to replicate this study with extension of the age range in both directions, in order to test further for sex differences in the development of lateralization patterns.

4. Feffer and Gourevitch (5) have suggested that the ability to shift spatial orientations, so that one can imagine the point of view of others, is a necessary antecedent of moving from social egocentrism to the capacity to assume various roles and "to put oneself into another person's shoes," generally. If this proved to be so, would training in making spatial transpositions enhance one's social perspicacity? Might the demonstration of such a connection provide a clue to the "missing link" between perception and personality?

5. It is interesting that neither handedness nor the ability to identify correctly one's own right and left hands, *per se,* bore a notable relationship to making either mirror-image or diagonal lateralizations. [The second finding contrasts with Benton's corresponding observations (2, p. 139).] However, confusing one's own right and left hands did occur significantly more frequently among contrary rather than consistent lateralizers—perhaps because such confusion coincided with unstabilized conceptions of sidedness, in general.

Mention should be made of a potential source of confusion in connection with the now popular procedure of asking subjects to identify corresponding body parts on themselves and on other persons. Previous investigators occasionally have confounded their results by instructing subjects to identify *right* or *left* body parts on others, rather than by requiring that they merely indicate *which side on the other person they considered to correspond to each of their own.* It is possible that the resulting responses were affected *both* by the ability to label "right" and "left" correctly from *any* perspective and by the capacity to shift viewpoints. The method used in the present lateralization tests eliminates such confounding of data by recording only whether the subject lateralizes the figure facing him in mirror-image or in diagonal fashion. (The subject's way of referring to his right and left hands is "accepted" whether it is correct or not, and his designation of the correspondingly named hand on the figure is recorded as mirror image or as diagonal, according to the designation signified.) Wider adoption of this procedure seems warranted

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[7] Vocabulary was measured by applying Cureton's Mental Age Equivalents (3) to the vocabulary test of the Stanford-Binet Intelligence Scale, Form M-L.

—and particularly so, where deficient capacity to transpose orientations is considered clinically significant.

When the developmental course of particular behavior systems is scrutinized, two questions typically arise: first, "what is the *characteristic pattern* of such development throughout some or all of the life span—or even throughout the history of the species?" and second, "what are the *processes underlying transitions* with respect to the behavior under investigation?" By combining cross-sectional with longitudinal sampling, it has been possible to explore both of these questions in the present context. To implement this strategy, age-associated patterns and transitional phases first were charted cross-sectionally at successive age intervals. Then a more intensive, partially longitudinal examination of a transitional phase was made in an attempt to gain insight into the mental processes involved in the developmental shift from making mirror image to making diagonally oriented lateralizations.

F. SUMMARY

The concept of sidedness is integral to conventional communication about spatial relationships. In relation to human figures, this study demonstrates that lateralization, defined as the attribution of sides, becomes increasingly relativistic during childhood. A simple test was applied to indicate which side of a self-drawing children considered to correspond to the right or left of their actual body. The percentage lateralizing such figures in mirror-image fashion was nearly equal to the percentage who lateralized them in 180° rotation (diagonally). Type of lateralization was found to be a function of age, sex, intelligence, and ability to transpose orientation. Most children who considered the corresponding hands of nonself-figures to be diagonally across from their own, also lateralized self-drawings in such fashion. Exceptions to this trend were examined in order to gain insight into the normative transition process from making mirror-image to making diagonal lateralizations of front-view human figures.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 127-140.

AN INQUIRY INTO THE RELATIONSHIP BETWEEN FIELD INDEPENDENCE-DEPENDENCE AND CREATIVITY* [1]

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A. INTRODUCTION

This paper is an attempt to examine some connections between field independence-dependence and creativity. Previous research and theory are reviewed in an effort to show that these variables seem to be closely related to each other. Nevertheless, there has been surprisingly little work connecting them directly and such work has produced ambiguous results. It is proposed that an extension of concepts from developmental theory may succeed in clarifying some details of the relationship between these two variables. After brief excursions into the developmental status of field independence-dependence and creativity, the author will concentrate on a rapprochement between these psychological islands and will conclude with an overview. No exhaustive review of the literature will be presented as it is available elsewhere for field independence-dependence in Witkin, Dyk, Faterson, Goodenough and Karp (58) and for creativity in Golann (15).

B. FIELD INDEPENDENCE-DEPENDENCE

Field independence has been a cognitive style of great interest to psychologists for more than 15 years. During this period, findings have multiplied as to the perceptual, intellectual, and personality characteristics of field independent and field dependent individuals. However, not until recently has any sustained attempt been made to propose a theory organizing the data in this field of inquiry. Thanks though to the efforts of Witkin and his colleagues (58), this problem has been alleviated.

These investigators have proposed differentiation as the overriding conceptual agent at work. This concept was borrowed from the comparative-developmental

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* Received in the Editorial Office, Provincetown, Massachusetts, on June 8, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This work was supported in part by grants from the National Science Foundation to The Pennsylvania State University and The University of Michigan for Summer Programs of Research Participation for College Teachers. The assistance of Dale B. Harris is gratefully acknowledged. A preliminary version of this paper was read at the Eastern Psychological Association Meetings, New York City, April 16, 1966.

framework of Heinz Werner, who championed the proposition that development involves an increase in differentiation and hierarchic integration. Primitive, developmentally early behavior is said to be global, diffuse, and lacking articulation between different areas of activity. As development proceeds to higher levels, functions become differentiated from each other and parts become discernible from a previously amorphous whole. They become discrete and articulated units. According to Werner, this theory stated the direction of development found in every psychological phenomenon: e.g., perceiving, thinking, learning, feeling, and language behavior. A detailed statement of his formulation may be found in works of Werner (51, 52) and Werner and Kaplan (53, 54).

Applying this principle to the area of cognition led Witkin *et al.* to the working hypothesis that field independent persons have achieved a higher level of differentiation than field dependent persons. The standard measures of field independence-dependence have been the Rod and Frame Test (RFT) and the Embedded Figures Test (EFT). Field independent persons were identified as those who moved a luminous rod more accurately to verticality in a darkroom and found simple geometric figures more rapidly than did field-dependent persons. Adequate performance on both tests requires differentiation of experience. The individual must perceive his environment in a discrete fashion in order to separate one item from the entire configuration. The field independent person is able to break up the total field and attend to the relevant items while withholding attention from the irrelevant items. One of his critical qualities is greater capacity for selective attention, a point which has been elaborated upon by Gardner and his co-workers (11, 12). On the other hand, the field dependent or relatively undifferentiated person cannot withhold attention from a tilted luminous frame surrounding the rod and complex designs camouflaging the simple figures.

Some objections (48, 59, 60, 61) have been voiced regarding the nebulous character of the differentiation concept and the failure to devote time to equally plausible alternative explanations. Nevertheless, the parade of research generated by this concept has been unabated by these criticisms. A survey of the field independence literature since 1962, when differentiation became a marshal for the cavalcade of empirical work in this area, discloses 15 studies that use this construct as a point of departure or a way of interpreting results (4, 5, 7, 8, 9, 16, 22, 23, 24, 26, 35, 36, 39, 44, 57).

The author is in complete sympathy with theoretical models as a guide to research endeavors, and, specifically, with efforts to understand field independence-dependence in developmental terms. In fact, the basic stance taken here is that the limits of this approach have not been fully exploited. Werner, it will be recalled, conceived of development as following two major trends: increased differentiation and hierarchic integration. Having briefly described differentiation, the author turns to hierarchic integration for a moment. It refers to a relationship that exists between operations belonging to different levels of functioning. In a state of hierarchic integration, operations characteristic of lower levels of functioning are subordinated to operations characteristic of higher levels. Primitive operations are capable of being inhibited yet used in the service of operations indigenous to developmentally increased maturity. In addition, according to Werner, the more advanced the level of differentiation, the greater the hierarchic integration. The highly differentiated person can regress to a level that will permit progression in novel directions more easily than the less highly differentiated person. It is the individual, as Maslow (32) says, with a strong ego who can afford to be ego-less.

While Witkin has made use (excessively, according to critics) of the differentiation concept,[2] he has tended to neglect hierarchic integration. Apparently, this omission is not due to ignorance of developmental theory because Witkin (56) states that "the more mature individual has a greater number of developmentally different operations at his disposal than the less mature individual." Differentiation precedes hierarchic integration temporally, since elements must be discriminated before they can be recombined to form new compounds. Analogously, hierarchic integration would appear to represent a higher level of development than differentiation.

There are at least two possibilities for Witkin's failure to discuss hierarchic integration as an ingredient in field independence. One is substantive; the other is methodological. It is possible that their greater differentiation may make field independent persons developmentally more mature than field dependent persons, but their lack of hierarchic integration may place them at a developmentally earlier level than other groups of persons. Or, maybe, some or all field independent persons possess hierarchic integration, but Witkin's current measuring devices fail to tap this capacity. A synopsis of the chief tests lends credibility to the latter assertion. The issue at stake in both RFT and EFT is ability to perceive units of the field as discrete. Field independent framework of Heinz Werner, who championed the proposition that development involves an increase in differentiation and hierarchic integration. Primitive, developmentally early behavior is said to be global, diffuse, and lacking articulation between different areas of activity. As development proceeds to higher levels, functions become differentiated from each other and parts become discernible from a previously amorphous whole. They become discrete and articulated units. According to Werner, this theory stated the direction of development found in every psychological phenomenon: e.g., perceiving, thinking, learning, feeling, and language behavior. A detailed statement of his formulation may be found in works of Werner (51, 52) and Werner and Kaplan (53, 54).

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[2] Even here he has embraced Werner's ideas incompletely. Writing that "we have no clear grounds for anticipating that activity, in the sense of high motoric output, will be related to mode of field approach," Witkin (58) fails to acknowledge a core notion in the differentiation concept: namely, that sensori-motor functioning is developmentally earlier than symbolic, abstract functioning. On this basis field dependent individuals should show physical hyperactivity to a greater extent than field independent individuals.

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C. CREATIVITY

Creative persons do, however. Barron (1) even claims that "the ability to synthesize . . . complexity is the mark of the creative individual." Crutchfield (6), in a similar vein, writes that "at the very core of the creative process lies the necessity for the combining or recombining or transforming of the cognitive elements of the problem in a novel and adaptive way." The creative person can free himself from orthodox means of solving problems; old solutions do not restrain him. Ordinary ideas and formulations are treated as unsatisfactory because closer examination reveals usually their oversimplified nature. The creative person's preference for complexity is manifested not only in his daily routine but also in laboratory situations where it has been found he tends to prefer complex rather than simple drawings (1, 30, 46).

Traditionally, authors have followed the lead of Wallas (50), dividing the creative process into four stages: preparation, incubation, illumination, and verification. Although this is an arbitrary mold into which to pour such a fluid substance as creativity, the second and third phases dramatize particularly well the synthesizing ability of concern here. Incubation refers to the temporary abandonment of conscious, rational problem-solving endeavors, often adopted when the person has reached an apparent dead end in his work. As attention is turned elsewhere, nonconscious impulses take over and facilitate the creative process, which culminates in illumination or the discovery of a solution for the perplexing problem. This peak experience represents an integration, as psychoanalysts say, of primary and secondary processes, made possible by the accessibility of preconscious and unconscious material.

This kinship to fantasy has been responsible for drawing a mistaken parallel between creativity and psychopathology. While creative people and patients have active fantasy lives on 24-hour alert (as opposed to so-called normals who rely on repression and sublimation to keep this material underground), the key difference is that the former sculpture impulses to play a constructive role in problem-solving enterprises, while the latter remain victims of their impulses. As Kris (27) and Schafer (40) have suggested, "regression in the service of the ego" occurs. Hersch (20) has acquired empirical support for this concept in a study of Rorschach protocols. He found that the creative person uses relatively immature modes of functioning, but is able to perform readily at a genetically advanced level as well. In contrast, the schizophrenic lacks the ability to function maturely and the normal lacks the ability to function primitively. Wild (55) has presented evidence, also, that creativity involves the ability to use psychological processes belonging to different developmental levels. If these studies are a reliable index of future trends, creativity research may bring together theorists of psychoanalytic and nonpsychoanalytic persuasions. Explanations by Freudians have pivoted around regression in the service of the ego, while Werner and his followers supply hierarchic integration as a theoretical aid to understanding the creative process. Conceivably, these constructs generate identical predictions. In that event, one could be dropped by mutual consent.

D. Field Independence-Dependence and Creativity

Up to now, the possibility of an interaction between creativity and field independence has been almost completely overlooked. Since the creativity literature contains many statements that creative persons see things differently than others, it is ironic that systematic examinations into their mode of perceiving have not been conducted as a rule. Also, Witkin, who has data in his latest book showing the manner in which field independence and intelligence are related, not once mentions the neighboring topic of creativity. Among those studies tackling the problem systematically, the most unequivocal findings come from Spotts and Mackler's (42) report that field independent persons were consistently more creative than field dependent persons. The few remaining explorations of this problem by Bieri, Bradburn, and Galinsky (3), Getzels and Jackson (14), and Rouse (38) yield essentially inconclusive results, although weak tendencies for more creativity in field independent persons were noted by Bieri *et al.* and Rouse. Possibly the failure to obtain more clearcut findings than were obtained was due to choice of criterion measures. None of the last three investigators used the RFT, even though it is the barometer of field independence in which researchers have greatest confidence.

However, it is very difficult to reconcile this possibility with the Spotts and Mackler data, obtained with an individual and a group EFT.

Unfortunately, these four studies exhaust the body of direct evidence, which is fragmentary, yet does point toward field independence as a necessary condition for creativity. In addition, empirical clues of an indirect nature support this view. Table 1 documents a list of traits that field independence and creativity research groups attribute to these two types of persons. The trait had to characterize both groups for inclusion in this list. Apparently, field independent persons share several personal qualities with creative persons.

TABLE 1
REVIEW OF STUDIES FINDING SIMILAR TRAITS IN FIELD INDEPENDENT AND CREATIVE PERSONS

Trait	Field independent	Creative
Low conformity	Linton (29)	Barron (2)
High level of incidental learning	Witkin *et al.* (58)	Mendelsohn & Griswold (33, 34)
Relative lack of repression	Witkin (57)	Myden (37)
Risk-taking	Kogan & Wallach (25)	Mackworth (31) Taylor & Holland (45)
Permissive parents	Dyk & Witkin (7)	Getzels & Jackson (14)
Low identification with mother (among males)	Vaught (47)	Garwood (13)

Still, the matter is not settled so easily, for there are circumstances when a field independent orientation handicaps creativity. For example, Crutchfield (6) holds that "analytical perception is sometimes the enemy of creative insight. What may be needed is a free spontaneous look at the phenomenon, a childlike apprehension of what is there, an attitude of what may be called disciplined naiveté." While creativity involves the task of dissecting bits of data and making a conscious, determined effort to unravel their meaning, it also involves the task of relaxing and letting the whole problem proceed in the direction it wants to. There comes a time when the problem assumes a momentum of its own and all the creative person needs to do is follow the path along which the problem takes him. Suppose that the individual engages in selective attention very early in the creative process. He focuses on the relevant items of the problem and discards the irrelevant ones prematurely. Considerable damage may be done by this maneuver as elements are tossed irretrievably offstage that later become essential for a creative solution. If, instead, global perception had prevailed for a while longer, it might have had a salutary effect on the subsequent sorting-out process, and elements might have been classified more judiciously. Shifts between an analytical and a global approach facilitate creative activity, with each perceptual mode making a vital contribution. The creative person must involve himself with the details of the problem for clarifying, classifying, and defining, but still obtain detached views of the entire problem from time to time for capturing attributes of the whole phenomenon that cannot be dissected and bringing back into focus elements previously sacrificed. The blending together of these two levels of functioning—involvement and detachment—is an uncommon event because the merger depends upon a developmental stage not attained by everyone—i.e., hierarchic integration.

The author's speculation is that some field independent persons are unable to adopt a playful, whimsical style of functioning. In returning this discussion to the earlier cited direct attempts at examining the interaction between field independence and creativity, the author believes that substitution of RFT for EFT would not alter the findings. It seems more likely that the results were a function of the developmental status of field independence than of biased measuring devices. The inability to obtain a clearcut relation signifies to us that some field independent persons reach this stage of hierarchic integration. Studies should yield various relationships between field independence and creativity: some, strongly positive; others, virtually none—depending on the proportion of subjects in the field independent sample who happen to be creative.

The major hypothesis of this paper should not be surprising: field independence is a necessary, but not sufficient, condition for creativity. Perhaps, therefore, all creative persons are field independent, while only some field independent persons are creative. The word "some" should be underlined because it questions Gallagher's (10) belief that field independence and creativity are different labels for similar cognitive styles.

To this observer field independence and creativity do not function as interchangeable terms. Future research on field independence might be well advised to break its samples down into a creative and noncreative group. When field independent individuals are studied as a total group, relationships may become badly blurred, which otherwise might be quite distinct. For example, several sources—Hellkamp and Marr (19), Levy and Rokeach (28), Messick and Fritzky (35), Ohnmacht,[3] and Stuart (43)—report no significant relation between field independence and an open-minded attitude. However, the fatal flaw in these investigations may be the treating of field independence as a homogeneous variable. If a study were designed along the lines proposed here, creative, field independent subjects should tend toward open-mindedness and noncreative, field independent subjects should tend toward closed-mindedness.

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[3] Personal communication from Fred W. Ohnmacht.

A portion of the extremely thorough work by Wallach and Kogan (49) lends itself to a multidimensional view of field independence. These investigators studied the sorting behavior of four groups of boys: high creativity-high intelligence, high creativity-low intelligence, low creativity-high intelligence, and low creativity-low intelligence. They found two important bases for grouping 50 pictures of ordinary objects. "Inferential-conceptual" grouping was done by locating a common element that all objects shared. "Relational or thematic" grouping was relatively playful, imaginative, and free-flowing, and it produced novel themes. Inferential responses make the individual focus on a single feature that all objects possess. Each object is treated as an independent example of the label, unlike relational responses in which all objects contribute in a different fashion to the label. In a group consisting of a lamppost, door, and hammer, "for hiding and protecting oneself" would be an inferential-conceptual response and "burglar waiting until his victims go to bed" would be a relational response. Wallach and Kogan found that creative boys, regardless of intelligence level, were able to change between the two bases for sorting. The remaining groups were inflexible. High intelligence-low creativity boys repeatedly gave inferential-conceptual responses and low intelligence-low creativity boys persisted in relational responses. Wallach and Kogan did not measure field independence. If they had, however, they might have found low creative-high intelligent subjects to be field independent and low creative-low intelligent subjects to be field dependent, with neither group able to shift its mode of perceiving. Their high creative-high intelligent and high creative-low intelligent boys resemble the present author's hypothesized field independent persons who have reached the stage of hierarchic integration.

Witkin's (57) latest comments show signs of clarifying matters. He has observed in clinical settings some field independent individuals who exhibit "fixity," or persistent functioning at a highly differentiated level, and other field independent individuals who exhibit "mobility," or functioning at varied developmental levels depending on inner and outer circumstances. His current impression is that the "fixity-mobility" dimension may be critical for distinguishing field independence and creativity.[4, 5]

This idea has been tested by Haronian and Sugarman (17) through a study

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[4] Personal communication from Herman A. Witkin.

[5] Haronian and Sugarman (18) have made an important conceptual refinement in an unpublished article, read by the present author shortly before completion of this paper. They state that hierarchic integration means subordination of developmentally

of reversal rate, under instructions to allow spontaneous shifts in a reversible figure, followed by instructions to resist shifts. They obtained a negative, although small, correlation between field dependence and decrement in reversal rate. However, the interesting result was that, while almost all field dependent subjects showed small decrements when instructed to resist shifts, there was no consistent relation among field independent subjects, as some produced sizable and others negligible decrements. Those with large reductions in rate were judged capable of adopting a passive-global view when instructed to do so and identified as "versatile" field independent subjects. They elaborate on the concept of "versatility" and conclude that the ability to shift from one level of perceiving to another is not found in every field independent person. While the present author thoroughly endorses their conclusion, he finds their operations questionable. Equating reversal rate under neutral instructions with adoption of passive-global view seems reasonable, but equating reversal rate under resistive instructions with adoption of a critical-analytic view does not. An improved procedure might be the instructing of subjects to make the stimulus reverse as fast as possible. Here, isolating the two figures in the reversible design is clearly the task and accomplished best by taking an analytic attitude. The author thinks the only convincing interpretation from the Haronian and Sugarman data is that field independent persons can shift behavior to meet task demands better than field dependent persons can. However, the flexibility of interest here (and to Witkin, as well as Haronian and Sugarman) has a more specific referent: i.e., the ability to shift developmental levels.

E. Overview

Witkin's work essentially has consisted of borrowing a concept from developmental theory and using it to explain some individual differences in cognitive style. The outcome of his efforts has been profitable from two standpoints. It has helped to bring cohesion to an expanding, diverse body of research. At the same time, it has served to acquaint many psychologists with the insights of Heinz Werner, whose contributions have long been ignored.

But Witkin has stopped short. There is no fundamental quarrel with anything he has said; rather the quarrel is with what he has not said. Hierarchic

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primitive levels of functioning to an advanced developmental level, and that mobility is the fluctuation between these developmental levels. However, mobility is designated the *sine qua non* for creativity in their theme, while our opinion remains that the capacity to integrate these developmentally diverse products is the more central event in the creative process.

integration is as basic a developmental trend as differentiation; it deserves an equal share of the headlines in evaluating field independence. In fact, this grandstand observer finds it difficult to see how Witkin could have made such an error of omission. This construct permits us to propose that field independence-dependence is not a simple bipolar dimension. While field dependent persons may all be similar due to limited differentiation, field independent persons may show marked contrasts with one another due to the greater variety of patterns of cognitive and personality organization possible at higher levels of differentiation. Some may be rigidly locked into an analytical mode of functioning, constantly striving to focus on detail, to structure their inner and outer experiences, to gain control, and to keep business before pleasure. In contrast are those capable of experiencing phenomena in a primitive, global, physiognomic way. They can relax, let their attention wander, take time out to enjoy some passing impression, or daydream. Like the former field independent type, the latter are able to adopt an analytic approach; unlike the former group, the latter are able also to adopt a global approach. They do not show "a more or less continuous experience of tense deliberateness, a sense of effort, and of trying," qualities which Shapiro (41) lists as typical of the obsessive-compulsive. They retain the ability to draw on a childlike sense of reality in which logic and affect merge and in which self and environment are not differentiated entities. The dual concepts of differentiation and hierarchic integration thus permit and really demand the division of subjects into field dependent, rigid field independent, and flexible field independent groups, for each of which it should be possible to generate separate predictions. This should be especially true in terms of creativity, which requires the capacity for hierarchic integration. The author hypothesizes that only flexible field independent subjects are creative. A corollary to this hypothesis is an idea for which Adelson[6] has gained clinical validation: namely, that creativity cannot be achieved by obsessive-compulsives.

Hierarchic integration, then, performs the function of clarifying differences between field independence and field dependence that have not been too explicit. In addition, it places the accent on a truly unique segment of Werner's theory. Other theorists, such as Piaget and Lewin, have stated that development entails increased differentiation. However, Werner alone emphasizes the parallel movement toward hierarchic integration. Inhelder and Piaget (21), for example, view the developmental process as consisting of a series of stages, each one higher than those that have gone before. Development is conceptualized as a sequence of replacements, so that lower stages give way to higher stages. The child outgrows the *sensori-motor* stage, enters the more complex stage of *preoperational thought,* and continues progressing through successive stages until the final era of *formal operations* is reached. Older, immature methods are repeatedly cast aside in favor of new, increasingly mature ones. Werner would argue that, as development proceeds, lower levels of functioning are not wiped out, but are used in the service of higher levels of functioning. Studies conducted along the lines suggested here seem suited for testing this basic principle within his system.

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[6] Personal communication from Joseph Adelson.

Finally and most importantly, these ideas yield possible new directions for future research on both field independence and creativity. One meaning for subsequent investigations of creativity seems clear. Their areas of interest should be expanded to include cognitive correlates, left largely unexplored until now. As for reports of field dependent persons, heretofore such persons have emerged from skirmishes with psychologists far more battle-scarred than field independent persons. Data has led most workers in the field to regard field independence as a *better* "style" than field dependence. At best, researchers pay lip service to Witkin's declaration that these variables are only *different* cognitive styles. Verification that field independent perceiving can barricade creativity would serve as a welcome antidote to the plethora of studies in which field independence is portrayed in an entirely favorable way. In any event, an increasingly critical appraisal of the developmental status of these variables should be undertaken. Our proposal, in a nutshell, is for a global approach to creativity and an increasingly analytical approach to field independence.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 141-146.

DIFFERENTIATION BETWEEN NORMAL AND DISORDERED CHILDREN BY A COMPUTER ANALYSIS OF EMOTIONAL AND VERBAL BEHAVIOR*[1]

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THERON ALEXANDER AND PAUL LEAVERTON

A. INTRODUCTION

Studies of emotion through the investigation of verbal behavior have been carried on for many years. Three decades ago, Lasswell (9) studied words in the vocabularies of political figures to obtain words that had particular positive or negative symbolic meaning such as "national honor" and "communism." At about the same time, Balken and Masserman (3) reported their analysis of the language of 15 patients in order to determine certain characteristics of neuroses relative to emotion.

Two decades ago, Dollard and Mowrer (4) counted words of "comfort" and "discomfort" to arrive at their Discomfort Relief Quotient (DRQ) and Raimy (12) used a similar system to classify positive and negative emotional expressions in counseling interviews.

Recently, Tomkins (15, 16) has written a two-volume work about his analysis of "positive and negative affect imagery." Laffal (8) has described a complex system of analysis of all language parts that distinguishes between normal and pathological behavior.

Also, in the last few years, investigators have used the computer not only to study language content but also to study perceptual and cognitive processes (6, 17). And the use of the computer for differential diagnosis in a wide number of conditions has been described by Mason and Bulgren (11). Other

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* Received in the Editorial Office, Provincetown, Massachusetts, on June 9, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This research was supported in part by the University of Iowa College of Medicine, National Institutes of Health, and the Computer Center of the University of Iowa. The initial part of the study was done while Theron Alexander was in the Department of Pediatrics at the University of Iowa. Acknowledgment is made of the assistance of Marjorie Clatterbaugh of the Iowa City public schools in obtaining the data from the school population. The subjects with behavior disorder were patients in the Child Development Clinic of the Department of Pediatrics. The considerable assistance of the University of Iowa Computer Center Staff is acknowledged, particularly that of Gerard P. Weeg, director; Paul J. Wolfe, operations manager; Stanley J. Walljasper; M. A. Rahimi; and Vincent Uthoff.

research reports and methodological discussions having some bearing on the present study are Dunphy, Stone, and Smith (5); Stone, Dunphy, and Bernstein (13); Stone, Bales, Namenwirth, and Ogilvie (14); Hays (7); Ledley (10); Alexander (1); and Alexander *et al.* (2).

In the present study, an effort has been made further to develop means of differentiation between normality and disorder by the use of specific stimuli for all subjects, empirical development of a lexicon, measurements of the extent of the response, and a control group of normal subjects. The purpose of this study is to use the computer to determine whether or not a significant difference occurs between children with behavior disorder and normal children in the use of emotional words and in total verbal output.

B. METHOD

1. *Subjects*

Two groups of subjects with an age range from 7 to 12, each group divided approximately equally according to sex, were selected for study. One group consisted of 38 children with a clinical diagnosis of behavior disorder; and the second group, 40 normal children, were matched on the basis of sex and age with the clinical group.

2. *Procedure*

Five stimulus cards were shown to all subjects individually, and the subjects were instructed to respond to the figures in each card and to describe interaction and emotion (see Figure 1). The responses were recorded verbatim and then placed on data processing cards.

A computer program was developed in a pilot study to provide a lexicon (Table 1) consisting of a group of five "positive" words and five "negative" words. In the present study, another computer program lists positive and negative words and provides totals of them for each subject. The program also supplies the total number of words used by each subject. A formula, $T + 50d$,

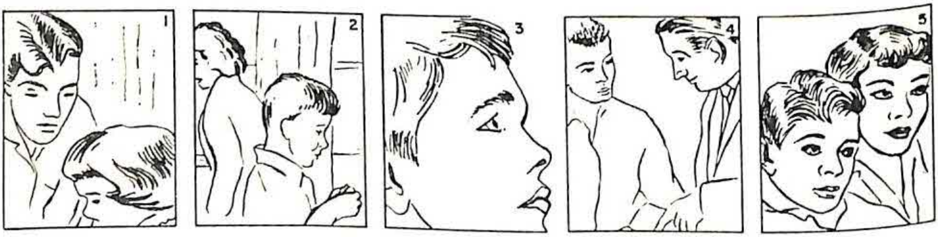

FIGURE 1
DRAWINGS OF THE FIVE STIMULUS CARDS USED IN THE PRESENT STUDY
The original cards are black-and-white photographs (1, 2).

TABLE 1
LEXICON: POSITIVE AND NEGATIVE EMOTIONAL WORDS USED TO INVESTIGATE RESPONSES OF SUBJECTS TO STUDY STIMULI

Positive	Negative
friend(s)	fight
good	mad
happy	sad
playing	scold
well	sorry

was derived with T standing for the total number of words used in response to the five cards and d standing for the algebraic difference between positive and negative words. The weighting factor of 50 was determined on the basis of the smallest number of classification errors (normal or abnormal) in reference to any other weighting factor.[2] The totals from the computer are used in the formula to obtain a score for each subject.

C. RESULTS

The distributions of the scores based on the formula $T + 50d$ according to the two groups are shown in Figure 2. The difference between the distributions of the normal sample ($N = 40$) and the behavior-disorder group ($N = 38$) is statistically significant ($p < .001$) as shown by the median test.

TABLE 2
FREQUENCY DISTRIBUTIONS OF GROUPS BASED ON SCORES USING FORMULA $T + 50d$

	Behavior-disorder subjects ($N = 38$)		Normal subjects ($N = 40$)	
Score frequency	Number of subjects	Relative frequency	Number of subjects	Relative frequency
0-99	16	.43	—	—
100-199	15	.41	12	.30
200-299	3	.08	9	.22
300-399	1	.02	8	.20
400-499	1	.02	4	.10
500-599	—	—	3	.07
600-699	1	.02	2	.05
700-799	—	—	1	.03
800-899	—	—	—	—
900-999	1	.02	—	—
1000-1099	—	—	—	—
1100-	—	—	1	.03

Table 2 shows the relative frequency of subjects falling in score categories. Table 3 provides information about the use of positive and negative words

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[2] This formula has some similarity to DRQ, but here the definition of negative and positive is exactly determined and directly takes into account length of response.

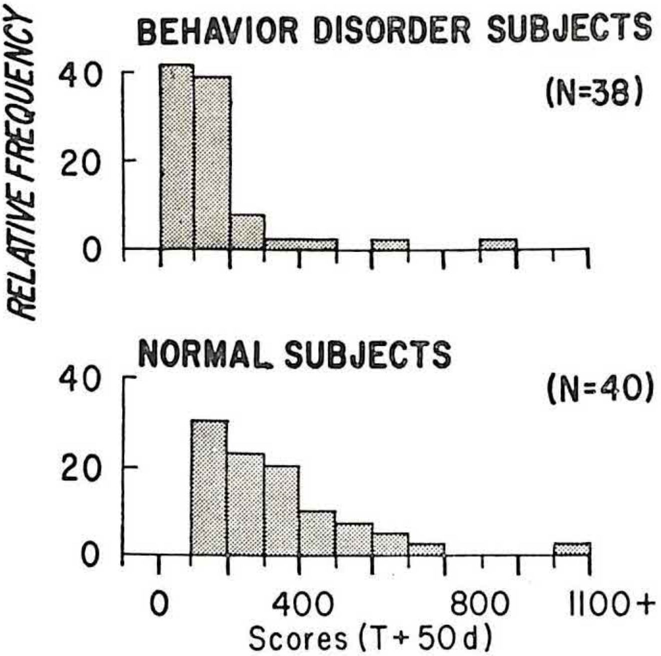

FIGURE 2
RELATIVE FREQUENCIES FOR GROUPS OF SUBJECTS BASED ON SCORES DERIVED FROM FORMULA $T + 50d$

and verbal output. Both factors differentiate between the normal and behavior-disorder subjects. No significant sex or age differences, however, were encountered on the basis of verbalization or type of emotional response.

TABLE 3
USE OF EMOTIONAL WORDS AND LENGTH OF VERBAL RESPONSE

Groups	Number of Subjects Using positive words	Using negative words	Using none	< 150 Words	> 150 Words
Normal ($N = 40$)	19	3	18	4	36
Behavior disorder ($N = 38$)	5	15	18	23	15

D. DISCUSSION

In this study it was found that the children with behavior disorder responded to stimuli differently from normal children due to the fact that children with disorder tend to use more words associated with feelings of hostility or depression than normal children. Such findings suggest that "positive" emotional perceptions tend to be associated with normality and that "negative" emotional perceptions tend to be associated with behavior disorder. It was also found that the total verbal output or responses of children with behavior disorder tended to be less than that of the normal children.

Although negative perceptions of disordered individuals, as well as inhibition in quantity of response, have been clinically observed, the results of this study provide one means of objective corroboration of such clinical observations.

The results of the study suggest that there is potential value in using the method to determine the possibility of the existence of psychological disturbances in large samples, such as children from culturally deprived areas.

E. SUMMARY

In this study computer programs were developed to differentiate between normal children and children with behavior disorder. Behavioral variables studied were total verbal response and positive and negative emotional words in reference to specific stimuli. Children with behavior disorder tended to have more limited verbal response and more negative emotional words than did the normal children.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 147-159.

THE EFFECT OF SYNTACTICAL STRUCTURE ON IMMEDIATE MEMORY FOR WORD SEQUENCES IN MIDDLE- AND LOWER-CLASS CHILDREN*[1]

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A. INTRODUCTION

In an earlier study (26) with preschool children aged 3 to 6 years, the authors found differences in immediate memory for reordered four- and six-word sequences. Certain syntactical arrangements of a simple declarative sentence were better recalled than others. The relative order in which the various modifications of syntactical structure reduced recall remained constant between the ages of 3 and 6 years and was similar to that found at college age. The authors suggested at the time that by 3 years of age children have already developed responses to speech that reflect a general linguistic frequency characteristic of English: namely, the relative frequency of occurrence or consistency with which word-class sequences are found as units or sequences in adult English speech.

Since the study was carried out on a very homogeneous group of middle-class children who shared the same speech community, not only among themselves but in many respects with the adult group as well, the question arose as to whether the findings could be generalized to another group of children whose acquisition of English had taken place in a different speech community.

Recent literature is replete with studies describing differences in language between middle- and lower-class children. Cherry (7) found differences in comprehension of middle-class speech by the two groups; Lesser (22) found that lower-class status was correlated with a pervasive lowering of mental ability scales; Deutsch (9) described a language deficit that cumulated from first to fifth grade for children of lower socioeconomic status and that was most pronounced for variables that required the children to categorize. C. Deutsch (8) found that performance on Wepman's auditory discrimination test correlated with tests of verbal ability and reading ability and hypothesized that children raised in noisy environments without much direct speech stimulation might well show deficits in discrimination and recognition of speech sounds. Templin (29) reports significantly poorer performance in about a quarter of her language measures, particularly in the areas of articulation of vowels and final consonants, grammatical complexity of remarks, vocabulary recognition at school age, and length of remarks at younger ages. John and Deutsch (19) also report shorter sentences for school children from lower-class than from middle-class backgrounds.

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* Received in the Editorial Office, Provincetown, Massachusetts, on June 15, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This study was supported by a National Institute of Mental Health grant No. MH 07477. Thanks are due to Dr. Joseph Zubin, who has so consistently encouraged this work by his interest and advice. We would like to acknowledge, as well, the excellent work of Jean Patenaude and her help in preparing the data for this paper.

In view of the mass of evidence testifying to differences between these two groups, the authors felt that, in order for their results to have any validity as a developmental finding, they had to be replicated on a lower-class group. The authors, therefore, selected a group of lower-class urban, negro children for this purpose.

The study presupposes that any group of English speaking children is exposed to a corpus of the language that exhibits certain invariances that are characteristic of general English speech. In addition, it assumes that the linking of words through the discriminative properties that constitute their syntactical structure reduces the number of units that need to be encoded in an immediate memory situation. The authors, therefore, used a recall measure as an index of the salience of the syntactical structure in the material. Specifically, the declarative structure was presented intact and with reversals occurring in less and less likely positions: i.e., subject-predicate, verb-object, noun-modifiers, and complete reversal of word order. If the order in which the children recall the word sequences is consistent with the relative frequency characteristics of English word orders, it can be concluded that the children have made the discriminations necessary for utilizing the structures in encoding. If not, then such children might be assumed to be functioning at an earlier stage, where only gross initial units can be used to improve recall; other subdivisions of these units cannot yet be discriminated by them and, therefore, cannot increase their ability to recall such sequences over word sequences arranged in random order. In the case of older children in a lower-class group, it might be concluded that their language is modeled after different invariances than the same-age children from a middle-class group.

The question, therefore, that the present study attempts to answer is whether there are salient features in syntactical structure that remain intact despite large variations in the speech and language patterns of different communities and that can be utilized by young children to facilitate psychological functioning, such as immediate memory. A further question concerns the problem of whether the ability to respond in this fashion to the structure of the language varies differentially with the age of the children in different groups.

B. METHOD

1. *Subjects*

The *S*s consisted of 60 children ranging in age from 3 to 6 years, who were attending a New York City Department of Welfare Day Care Center.[2] The Day Care Center serviced a low-income, predominantly American-born negro, ghetto neighborhood in Harlem. All the children were negro and came from lower-socioeconomic-status homes, more than half of which had no fathers living regularly in the home. The parents worked in domestic or other service occupations or were in the process of looking for work.

Comparisons will be made with another population of 45 nursery-school children reported on extensively in a previous study (26). The children of that study can be described as an all-white Jewish middle-class population of approximately the same age and schooling as the children in the present study.

2. *Apparatus*

A thorough description of the apparatus can be found in Salzinger *et al.* (26). Briefly, the apparatus consisted of a papier-maché clown's head with a red light-bulb nose, which could be turned on and off by *E* to supply reinforcements; a trinket dispenser for the same purpose; a wooden toy mallet; two tape recorders; and a burlap screen which, when placed on the table, separated the child and the stimulus display from *E* and the tape recorders.

3. *Procedure*

Before testing the *S*s individually, the two *E*s visited them in their classrooms and read them an illustrated story about the adventures of "Happy the Clown." The story not only served the purpose of introducing the clown, but also elicited from the *S*s, in a familiar group setting, the types of responses later required during individual testing.

Each *S* was then brought individually into the experimental room. He was seated in front of the papier-maché clown at the table and the microphone was hung around his neck. He was shown the clown, the trinket dispenser, and the mallet, and told that the clown would speak to him and play games with him. The clown then partly sang, partly spoke the following tape-recorded instructions (S^r indicates reinforcement):

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[2] Mt. Morris Day Care Center. The authors would like to acknowledge the wonderful cooperation they received from Miss Berry, the director, and the staff of the Center.

> [whistling.] I'm so happy [S^r_1 = clown's nose lighting up], I'm so happy [S^r_1], I'm so ha-pa-pa-ha-pa-pa happy [S^r_1]. Whoops, well hi there. My name is Happy. What's yours? [*S*'s response] [S^r_1]. That's a nice name. Say, how do you like that? Whenever I'm happy my nose lights up. You know what? I like you. If you say "hello" to me I'll give you a present. [*S*'s response] [S^r_1] [S^r_2 = delivery of trinket.] Do you remember how we said "boo" to the lion? Well, if you say "boo" for me now, I'll give you another present [*S*'s response] [S^r_1 S^r_2].

The clown then had *S* imitate two identical series of taped auditory stimuli, one of rhythmic "boos" and one of rhythmic mallet taps. Each series consisted of nine items: one boo or tap; three equally spaced; four equally spaced; four, the first two and the last two equally spaced but separated by a longer interval in between (i.e., two—two); five; three—three; six; seven; three—four. Every response by the child was followed by S^r_1 and S^r_2: i.e., children were reinforced for attempted imitations, not necessarily correct ones. The following instructions were then given by the clown for the verbal response task:

> Great! You're just great. You're just wonderful. Say, do you know my favorite game? [*S*'s response] [S^r_1]. Well, I call it silly mixed-up words. The silly mixed-up words I say are so silly and so ridiculous that even ferocious lions laugh at me. Say, I'll bet that you can say some of my favorite mixed-up words. O.K.? [*S*'s response] [S^r_2]. Now listen carefully, and after you hear me say my silly thing, then you say it right after me. O.K.? [*S*'s response] [S^r_1].

Twelve sequences of single syllable words were then presented, one at a time, for *S* to imitate. All attempts at imitation were reinforced by S^r_1 and S^r_2. Five different types of word sequences were used: (*a*) simple declarative sentence, (*b*) reversal of subject and predicate, (*c*) reversal of verb and object, (*d*) reversal of noun and modifier, and (*e*) complete reversal of declarative sentence.[3] Two sequence lengths, one of four words and the other of six words, were used to sample each of the five types of reordered sequences. Two practice items were given to all the children initially. (See Salzinger *et al.* (26) for a sample list of stimuli and the orders of presentation.)

C. RESULTS

In order to test for the relative effects of syntactical structure on recall as a function of age, the total group of 60 children was rank ordered by age and then subdivided into five successive groups each comprised of 12 children. The mean ages and age ranges for each group can be found in Table 1.

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[3] The intonation and rhythmic patterns adopted for each stimulus were based on standard English intonation for the intact parts of each stimulus sequence, with pauses between the intact portions of about the duration of the pauses that ordinarily separate phrases.

Each child's recall of a given stimulus word sequence was scored in two ways. The first was the largest number of correct words recalled in the order presented—the longest sequence of words recalled. The second was the longest sequence of lexemes recalled—a lexeme being defined as a child's rendition of the stimulus word, which, although inaccurately inflected, indicated that he had perceived the meaning of the word. This procedure permitted the child changes in the inflection of any word, such as dropping of word endings indicating tense and number.

TABLE 1

MEAN AGE AND AGE RANGE IN YEARS FOR EACH OF FIVE AGE GROUPS

Age group	Lower class *M*	Lower class Age range	Middle class* *M*	Middle class* Age range
I	3.7	3.4-3.9	3.2	3.0-3.3
II	4.3	4.0-4.5	3.6	3.4-3.7
III	5.0	4.5-5.2	4.0	3.8-4.4
IV	5.4	5.2-5.6	4.5	4.4-4.7
V	5.8	5.6-6.0	5.0	4.8-5.8
Total	4.8	3.4-6.0	4.1	3.0-5.8

* The ages of these children are inserted here for ease of comparison. A detailed analysis of this group was presented in a prior study (Salzinger *et al.*, 1966).

Analyses of variance using a three-way layout in a mixed model (27) were applied separately to the word and lexeme scores for both the four- and six-word sequences in order to determine the effect of age and structure of sequences on recall. Figure 1 presents the means of the longest sequence recalled as a function of age with the syntactical structure of the sequences represented as a parameter.

Significant differences ($p < .005$) among the age groups were found for all the conditions, four- and six-word sequences scored for either words or lexemes. Inspection of Figure 1 shows that the increase in age is positively related to an increase in recall scores. The decrease in recall of words for the older children appears to be more a function of inaccurate word inflection (e.g., dropping word endings) rather than an inability to recall the sequential or syntactical organization of the word sequences, as can be seen when comparison is made of the sustained trend of the lexeme curves with the dip in the word curves for the oldest group.

The mean longest sequence recalled differed significantly ($p < .005$) with respect to the five types of word sequences (see Figures 1 and 2) for both the four- and six-word sequences scored for both words and lexemes. The differences, as in the former study, were more pronounced for the six- than the four-word sequences.

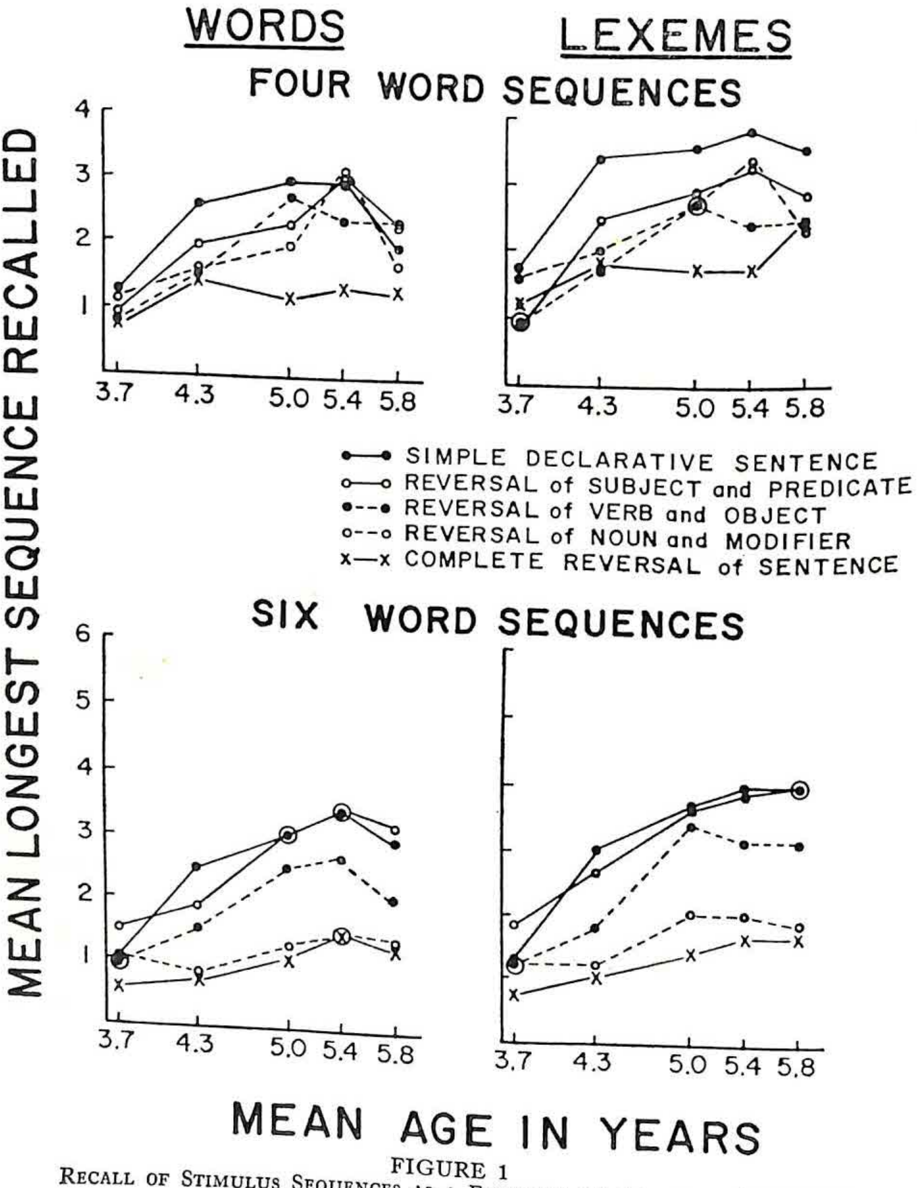

FIGURE 1
Recall of Stimulus Sequences as a Function of Age with Structure Varied as a Parameter

None of the conditions produced a significant interaction between age and recall of types of word sequences ($p > .05$), indicating that there is no systematic effect of age on the order in which the various types of word sequences are recalled. The means graphed in Figure 2 show that immediate memory decreases with reorderings of constituent sequences of words in a simple declarative sentence in such a way that best recall is found for the intact declarative sentence [1],[4] next best for the subject and predicate reversal [2], next for the reversal of verb and object [3], next for the reversal of nouns and their modifiers [4], and poorest for the complete sentence reversal [5].

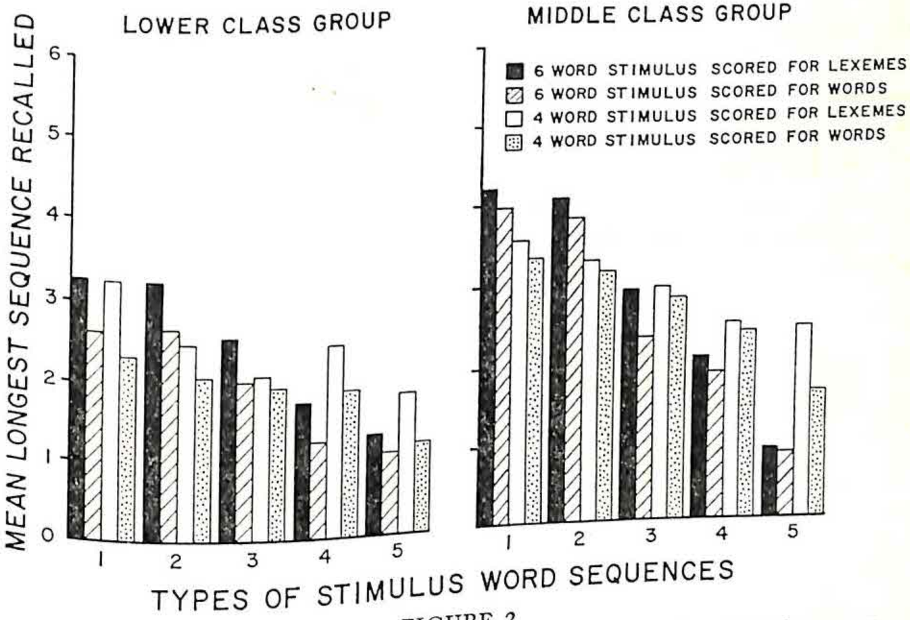

FIGURE 2

RECALL AS A FUNCTION OF DIFFERENCES IN THE WORD ORDER OF STIMULUS SEQUENCES

These results are completely in accord with prior results obtained on a group of middle-class children (26). However, further inspection of Figure 2, which represents data from both groups, shows some interesting differences. Although the relative order in which reorderings of a declarative sentence produce decreases in recall is the same for both groups, the middle-class group shows better absolute recall of all the types of word sequences except for the six-word completely reversed sequences. This last may be an interference effect of the lack of syntactical structure in longer sequences for the middle-class group (26). The difference in absolute recall scores for the middle- and lower-class group is probably more pronounced than appears when one considers the fact that the middle-class group is, on the average, nine months younger than the lower-class group.

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[4] The numbers refer to the corresponding numbers on the abscissa in Figure 2.

One other interesting difference emerges upon inspection of Figure 2: namely, the effect of scoring the responses in terms of words or lexemes. The lower-class group shows a more marked improvement in recall of lexemes over that of words than the middle-class group. In an additional tabulation, the authors found that the proportion of the recall scores that could be attributed to inflection remained invariant with age. This indicates that the lower-class group is processing less information about the stimulus sequences than the middle-class group, whose imitation is much closer to the original stimulus.

A final comparison was made between the two groups of their performance on imitation of the two sets of nonverbal sequences—the tapping which required a nonvocal motor response and the booing which required a vocal motor response. Table 2 presents the proportion of children in each of the two groups who imitated each stimulus sequence correctly. There is a slight trend indicating better performance for the lower-class group, but chi square tests showed this pattern to be significant in only two instances. The difference in age between the two groups may well account for the slightly better motor performance in the lower-class group, and the result might be better interpreted as showing that the performance of both groups was the same.

TABLE 2
PROPORTION OF CHILDREN IN LOWER- AND MIDDLE-CLASS GROUPS CORRECTLY IMITATING NONVERBAL STIMULUS SEQUENCES

Stimulus sequences	Tapping LC $N = 60$	Tapping MC $N = 45$	Booing LC $N = 60$	Booing MC $N = 45$
1	.82	.87	.98	1.00
3	.82	.80	.77	.69
4	.62	.56	.62	.47
2-2	.40	.36	.62	.40*
5	.50	.38	.28	.33
3-3	.60	.42	.40	.29
6	.32	.27	.17	.20
7	.25	.24	.22	.13
3-4	.20	.04*	.12	.13

* $.04 < p < .05$ tested by chi square.

D. Discussion

Having replicated the results of their former study, the authors are led to conclude that preschool children from diverse speech communities (i.e., lower- and middle-class) make use of the same aspects of syntactical structure in facilitating such psychological functioning as immediate memory for verbal sequences. The order in which various syntactical arrangements of the words in a declarative sentence help the children to process information may well correspond to the relative frequency of distributional regularities in adult English. Furthermore, the fact that responses to modifications in the structure of the word sequences was not shown to change significantly with age (i.e., no significant interaction was found) indicates that children's ability to respond to some basic syntactical characteristics of the language is established quite early. There is, however, some graphic indication (see Figure 1) among the youngest children in the present study that the order of the various syntactical arrangements is not as clear as for the older children, although this was not statistically significant.

Since the speech communities of lower- and middle-class children differ, the corpus of English speech to which they are exposed should also differ. If, then, the children utilize the forms of adult speech as a model stimulus for imitation, discrepancies in the children's utilization of structural characteristics should emerge. The fact that such syntactical discrepancies were not found suggests that there are invariances of the relative frequency characteristics of word order common to very different speech communities, which have enough salience to act as effective stimuli. Studies describing these invariances and detailing the differences for adult speech (1, 12, 14, 15), particularly speech used when addressing children, are scarce. Furthermore, they have generally been performed on written material, which, conceivably, may turn out to show some differences in structure although there is some evidence to the contrary. Often the studies are carried out on single words or pairs of words rather than on the syntactically structured units, which have been described by many linguists, but whose distribution in actual speech has never been computed.

There is evidence from a number of sources in the literature that there is a "psychological unity" (23) for certain word orders, which is difficult to break down (18). The authors would choose to consider these response units (25). Those which emerge most often and earliest in studies of children's speech appear to be a function of the acquisition of predication (4, 5, 11, 20), in the early stages being called pivot and x-class words, and were found in the present study, as well, where the reversed subject and predicate sequence served the children almost as well as the intact declarative sentence. That this response is so strong at such an early stage is not surprising when one considers that practically all adult spoken sequences exemplify it.

Granted that there is an underlying physiological appropriateness for the acquisition of speech in humans, the present authors do not see the need to fall back upon some inborn knowledge of the rules for basic structures, such as is postulated by McNeill and Fodor (13, 23), to explain why children of different speech communities in a language group grow up speaking essentially the same grammar. Rather, the authors prefer to consider the fact that living organisms can tolerate quite a lot of variability, or noise, in stimuli during the acquisition of response classes, and that, in fact, such variability often strengthens the response classes rather than changes them (17).

In some respects, however, we have found that the lower-class children differed from the middle-class children. One of these was the fact that requiring the children to imitate not only sequence but also inflection produced poorer performance among the lower-class children, whereas this requirement had no effect on the middle-class children's performance. Since the proportion of the recall scores attributable to inflection does not change with age for either group, it is our interpretation that the difference between the two groups reflects an inflectional difference in the corpus of speech to which the children of each speech community are exposed. In this area, too, there is a need for distributional descriptions of the structure of adult speech in different groups.

The present study also found an overall depressed level of performance in the lower-class children's recall of all types of verbal sequences, which was already in evidence at the youngest age level and which is more pronounced than might appear at first, in view of the fact that the lower-class group is somewhat older than the middle-class group. Both Deutsch *et al.* (10) and Lesser *et al.* (22) have claimed that an overall verbal deficit appears to be a function of class rather than racial or ethnic characteristics. That this is a verbal deficit only is supported by the fact that the lower-class children performed either at the same level or better on a similar nonverbal task, even when they were required to make a vocal response. What we seem to be dealing with here is not a generalized lack of attention or an inability to adapt to the testing situation, but the specific problem of depressed functioning in the verbal area.

There is a growing literature, some of it admittedly speculative (16), that attempts to explain why lower-class children should perform poorly in the verbal area. In general, the argument is as follows: Lower-class children live in smaller, more crowded and noisy circumstances than middle-class children (3). Much of the adult speech heard around him by the child is not relevant to his functioning, with the result that he may, therefore, learn to tune it out (8). When it is relevant, it refers more often to less abstract topics and more concrete everyday functioning (e.g., commands) than speech directed at the middle-class child. Furthermore, many of the adult-child verbal interactions that are found in middle-class homes may not be found in lower-class homes due to the fact that there are fewer ritualized formal occasions for conversation, such as mealtimes (2, 9, 21). And finally, child care is not exclusively an adult task in lower-class homes, much of it being undertaken by older siblings. Cazden (6), who believes that the amount and richness of language stimulation available in the context of face-to-face interaction is important for speech acquisition, claims that differential exposure to the adult model accounts for the differences found among different subcultural groups.

It is the feeling of the present authors that the argument outlined above, although in some respects attractive and plausible, must be taken as hypothetical because the descriptions of the verbal environment in lower-class homes (and, for that matter, in middle-class homes) are based on indirect information-gathering techniques rather than on direct experimental or observational evidence taken in the homes themselves. A beginning, along observational lines, has been made by Vivian Horner, who recorded spontaneous speech in lower-class homes for long periods of time (28), and by Rheingold (24), who observed maternal care. Although Rheingold, herself, notes difficulties with her techniques, they are encouraging and could be extended so as to deal with language observation in homes. In addition, it would be fruitful to adapt some of the observational techniques utilized in anthropology for studying unfamiliar cultures.

E. SUMMARY

A group of 60 urban, negro lower-class children aged 3 to 6 years were tested on their immediate memory for various reorderings of a declarative sentence. Recall increased with age and similarity to standard frequency characteristics of English.

These results replicated similar findings on a white middle-class group of approximately the same age. However, a difference was found between the groups with respect to the absolute recall of all the verbal sequences, although not for similar nonverbal sequences. The implications of the findings were discussed with reference to problems in acquisition of language and the effects of socioeconomic variables on children's language.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 161-167.

ASCENDING-DESCENDING DIFFERENCES IN *CFF* MEASUREMENT AS A FUNCTION OF ECCENTRICITY AND STARTING POINT*

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NORMAN GINSBURG

A. INTRODUCTION

According to Landis, "The fact that the ascending and descending thresholds are not the same is a phenomenon of interest that has never, to my knowledge, been systematically studied" (6, p. 268). Both Landis and Chyatte (2) attempted to explain the difference in terms of perceptual set. However, they failed to agree on the direction of the predicted difference. Landis believed that the descending (*D*) values were lower, while Chyatte claimed that the ascending (*A*) values were lower. According to the evidence presented by Chyatte, the *A* values averaged .9 cps lower than the *D* values.

Instead of appealing to the concept of set, Mahneke depended on the effect of the test stimulus itself during threshold determination: "The low value of . . . [*A* thresholds] can be explained in part by the fact that exposure to flickering light, even of short duration, causes the FFF to be lowered" (7, p. 117). A number of workers have shown that the *CFF* is depressed by prior exposure to intermittent light. The first of these were Granit and von Ammon (5), who labeled the effect "local adaptation" (*LA*).

LA results from exposure to an intermittent light flashing at a frequency below *CFF*, but not from one above *CFF* (4, 9). That is, adaptation will take place if the light appears to flicker, but not if it appears steady. Therefore *LA* should occur during an *A* trial, but not during a *D* trial.

According to the above reasoning, one would expect that any variable that affects *LA* would also have a predictable effect on the *D-A* difference. Two such variables will be examined below: (*a*) eccentricity, the effects of which can be tested directly, and (*b*) duration of exposure, the effects of which can be tested indirectly by varying the starting point (*SP*).

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* Recommended by Joseph Zubin of the Editorial Board; received in the Editorial Office, Provincetown, Massachusetts, on June 21, 1967; and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

B. METHOD

1. *Observers*

The *O*s were 42 undergraduate students of general psychology at Roosevelt University, Chicago. Twelve were used in Experiment I, and 30 in Experiment II.

2. *Apparatus*

The intermittent light was provided by a Lafayette electronic flickometer, Model 1202A. Rate of flashing, which was changed automatically with an acceleration of 1 cps per second, varied between 20 and 60 cps. The target, an orange light one inch in diameter, viewed at one yard, subtended an angle of 1½°. Its luminance was 10mL.

3. *Procedure*

O fixated binocularly either the center of the target or, for peripheral stimulation, a ⅛-inch black bead. At the beginning of each trial, a shutter was opened and *O* was told to press a button. The button started a motor that changed the frequency of the intermittent light. *O* released the button when the target began to flicker or when flickering stopped, according to instruction prior to each trial.

C. EXPERIMENT I

In this experiment the effect of eccentricity on the *D-A* difference was studied. It has been shown that *LA* is greater in the periphery (4). If it is true that *D-A* depends on *LA*, then the difference should increase toward the periphery.

1. *Procedure*

Following practice trials that used fixation points above the target, each *O* was given 12 trials with fixation points below target. The order of testing of the six retinal areas (0, 2, 4, 6, 8, and 10°) was determined by a 6 × 6 Latin square. Each *O* was tested at these six positions in this manner: *A, D, D, A, A, D* (or the reverse); then the same areas were tested in the same order in this manner: *D, A, A, D, D, A* (or the reverse).

2. *Results*

Figure 1 shows mean *CFF* scores for different retinal positions. According to analysis of variance, direction of testing (*D* vs. *A*) was highly significant ($F = 254$, $df = 1$, df for the error term $= 121$, $p < .001$). *D-A* differences, as predicted, increased with eccentricity ($F = 5.67$, $df = 5$, df for the error term $= 55$, $p < .001$). When each peripheral area was compared with all

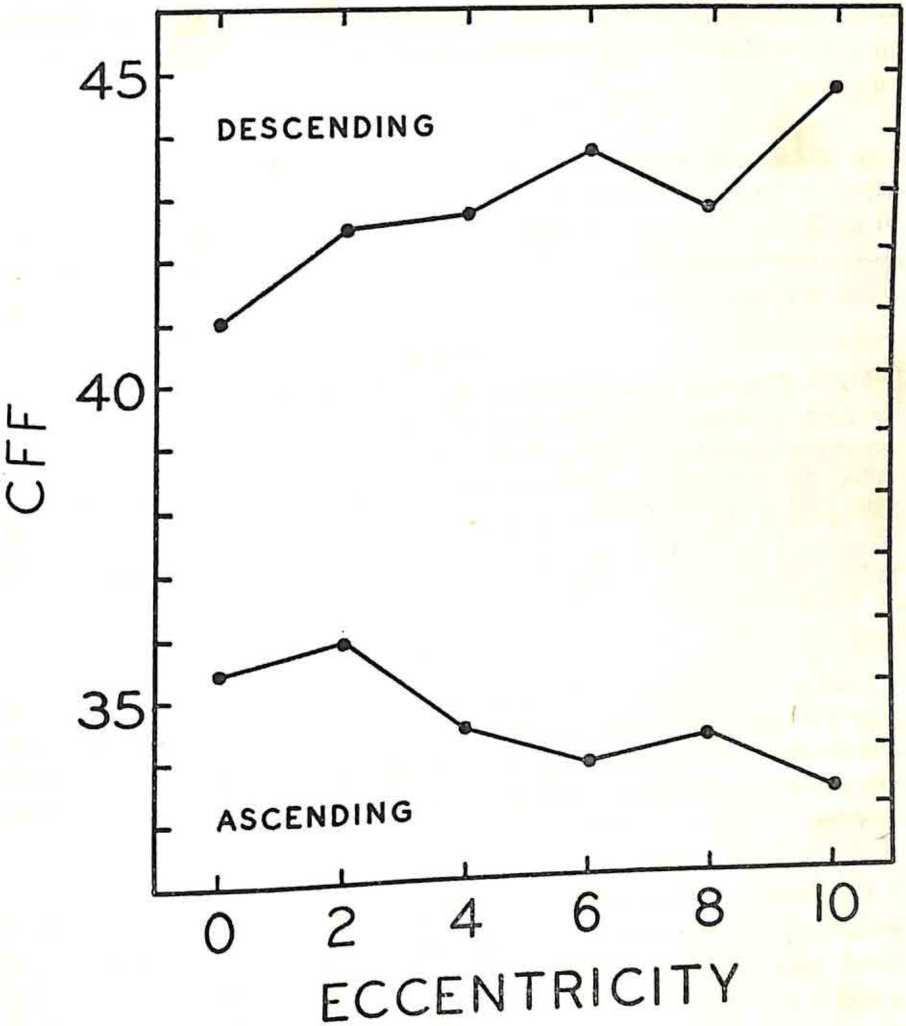

FIGURE 1
CFF (Cycles Per Second) as a Function of Eccentricity

areas central to it, the peripheral area yielded a greater difference in 14 of the 15 comparisons. Of these comparisons, seven were shown to be significant by the Duncan range test ($p < .05$). The one inversion was not significant.

D. Experiment II

Rey and Rey (9) have shown that *LA* increases as a function of the duration of the adapting stimulus. One way of prolonging the stimulus is to move the *SP* farther from the *CFF*. This should tend to lower the *CFF* on *A* trials, but not on *D* trials. Such a change of *SP* should, then, increase the *D-A* difference.

1. *Procedure*

In this experiment *SP*s were varied over a range of 10 cycles in 2.5-cycle steps. *SP*s for *D* trials ranged from 50 to 60 cps; *SP*s for *A* trials ranged from 30 to 20 cps. To avoid cumulative effects, 10 different fixation points were used, situated around a circle 6° from the center of the target. Five different orders of presentation of the 10 *SP*s were used.

2. *Results*

Figure 2 shows *CFF* as a function of *SP*. As *SP*s were moved farther from the *CFF, D-A* differences increased. The effect of the change in *SP* was significant at the .001 level ($F = 19.373$, $df = 4$, df for the error term $= 116$). When the *D-A* difference for each *SP* was compared with the differences for *SP*s closer to the *CFF,* those farther away yielded a greater difference in all 10 comparisons. Eight of these comparisons were shown to be significant by the Duncan range test ($p < .05$).

E. DISCUSSION

Previous explanations in terms of set have led to ambiguous predictions in regard to *D-A* differences. Landis argued that "the difference between the two thresholds acts as if an established steady state of adaptation or an established intermittent state tends to persist, or as if an established appearance has a certain inertia which resists change" (6, p. 268). This view leads one to expect higher *A* values.

On the other hand, Chyatte claims that "set to perceive flicker in a source of light will involve contraction of perivascular neuroglia, dilation of cortical blood vessels, and a resulting enhancement of critical flicker frequency levels . . . set to perceive fusion will tend to relax neuroglia, constrict vessels, and result in a drop in critical flicker frequency" (2, p. 353). How the difference in set could produce these differences in physiological consequences is not made clear.

It seems to this writer that, since the concept of set can lead to diametrically opposite predictions, it is of limited value in explaining *D-A* differences. The concept of *LA,* on the other hand, leads to increasingly clearcut predictions. Any variable that increases *LA* should lower *A* values, but not *D* values. Therefore as *LA* increases, the *D-A* difference should also increase. The predicted increase occurred in both of the above experiments.

In Experiment I, we can examine the relative contribution of changes in the *D* and the *A* values toward the changes in *D-A* differences. The literature ordinarily reports a rise in *CFF* toward the periphery with a target of the size used above (6). This has been attributed to greater spatial summation

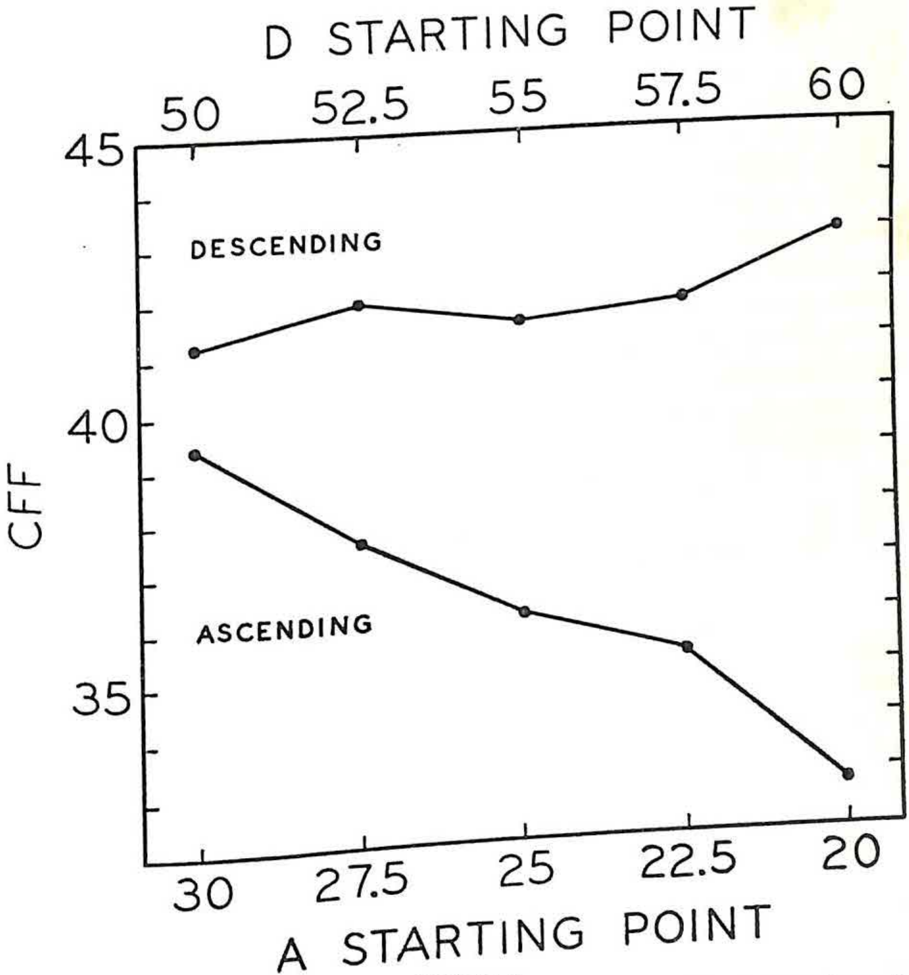

FIGURE 2

CFF (Cycles Per Second) as a Function of Starting Point (Cycles Per Second)

for rods. Analysis of variance shows that for the *D* trials *CFF* increased toward the periphery ($F = 3.34$, $df = 5$, df for the error term $= 55$, $p < .025$). The *A* values, on the other hand, show a decrease toward the periphery, though not significantly ($F = 2.24$, $df = 5$, df for the error term $= 55$,

$p > .05$). It is suggested that the results are a product of the interaction of two factors: an increased *CFF* toward the periphery, and an increased *LA* toward the periphery. With *D* trials only the first factor operates; with *A* trials, the effects of both factors summate algebraically.

Inspection of Figure 2 shows that the change in *D-A* differences with the change in *SP* was primarily the effect of the drop in *A* values ($F = 64.78$, $df = 4$, df for the error term $= 116$, $p < .001$). The Duncan range test shows that each 2.5-cycle drop in *SP* produced a drop in *CFF* that was significant at the .01 level. Ryan, Bitterman, and Cottrell also found that lower *SP*s produced lower *CFF*s (10). In their study a 10-cycle drop in *SP* brought a change of *CFF* from 38.25 to 34.37. In the present study the change was from 39.39 to 32.83. The greater change was to be expected, since the former study used foveal stimulation, while the present study used the periphery, which produces greater *LA* (4).

The rise in *SP*s for *D* trials also caused a higher *CFF* ($F = 5.32$, $df = 4$, df for the error term $= 116$, $p < .001$). This was not predicted and cannot be explained by *LA*, unless one assumes that exposure to a light that appears fused causes the *CFF* to rise. This has, in fact, been claimed by Alpern and Sugiyama (1). However, Rey and Rey (9) and Ginsburg (4) failed to find any effect on *CFF* from exposure to an intermittent light of a frequency higher than the *CFF*. It is suggested that this point is in need of further study.

Another way of prolonging the exposure to the adapting stimulus is to slow up the rate of change of the intermittent light while maintaining the same *SP*. Mahneke (7) found that the *CFF* was approximately the same for *D* and *A* trials with a rate of 5 cps per second. As the acceleration was decreased, *A* thresholds were lowered while *D* thresholds remained about the same. This can be explained by the depressing effect of *LA* on longer *A* trials. With minimal exposure—i.e., with discrete rather than continuous presentation of the stimulus (8)—there was no difference between *A* and *D* conditions. They both produced *CFF*s similar to those of continuous *D* trials.

Granit and von Ammon found that *LA* was greater with higher intensity (5). From this we would predict a larger *D-A* difference with a brighter target. Such a result was found by Dillon (3) for his normal *O*s.

The usual practice in the use of the method of limits to measure *CFF* has been to test in both the *D* and *A* directions in alternation and average the two. The evidence cited above shows that *D* and *A* trials differ in their response to changes in a number of variables. Is it not likely that the averaging technique may obscure some relations between *CFF* and these other variables? Dillon

(3), for example, showed that schizophrenics differed from normals in their *A* values, but not in their *D* values.

F. SUMMARY

Forty-two *O*s were tested for *CFF* by the method of limits. Scores obtained from Ascending (*A*) trials were lower than those from Descending (*D*) trials. The difference between *D* and *A* increased with eccentricity, going from 5.6 cps at the fovea to 11.4 cps at 10°. Moving both *D* and *A* Starting Points 10 cycles in a direction away from the *CFF* increased the *D-A* difference from 1.83 to 10.13 cps. These results, as well as those of other investigators on acceleration, continuity-discontinuity, and brightness, were attributed to Local Adaptation generated during *A* trials but not during *D* trials.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 169-181

EFFECTS OF TWO MEPROBAMATE-AMPHETAMINE COMBINATIONS ON MOODS, EMOTIONS, AND MOTIVATIONS*[1]

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A. INTRODUCTION

This paper is one in a series describing the results of studies carried o over a period of 13 years, wherein essentially identical methods were used the study of methodological problems of drug research and the actions certain medications. The procedures were designed to make an assessment drug-induced changes in a wide variety of moods, emotions, and motivatior and to make this assessment in such a way that the "placebo effect" w eliminated and a high degree of sensitivity achieved. Each experiment eval ated a number of drugs and placebo. Preceding papers have described metho (3), the effects of placebo and of dramamine (4), of benzquinamide (2), amphetamines (1), of meprobamate (5), and of two preparations designe for appetite suppression, chlorphentermine and an amphetamine-amobarbit combination (6).

The present paper describes the effects of two meprobamate-amphetamir combinations on moods, emotions, and motivations of male and female colleg students who were 21 years or older. There were 66 subjects who receive 600 mg meprobamate + 10 mg Benzedrine sulfate and a total of 162 placeb determinations (30 *S*s received three administrations and 36 *S*s received tw administrations of placebo). A second group of 78 subjects received 400 m

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* Received in the Editorial Office, Provincetown, Massachusetts, on June 22, 1967 and published immediately at 35 New Street, Worcester, Massachusetts. Copyright b The Journal Press.

[1] This paper is number XII of a series, "Chemical Studies of Behavior." The studie of meprobamate-amphetamine combinations here reported, conducted in the period o 1958-1965, were supported by a number of agencies in addition to the University o Rochester: Wallace Laboratories, Chas. Pfizer & Company, Inc., Bristol-Myers Com pany, Smith Kline & French Laboratories, Menley and James Laboratories, Warner-Lambert Research Institute, National Institute of Mental Health (Grant No. MH-4681) and Office of the Surgeon General of the Army (Contract No. DA-49-193-MD-24) Eugene Sachs, Cameron, and Wendt conducted the 1958 experiment. Otherwise the work was done by the present authors. The writers acknowledge their gratitude tc Alvin L. Ureles, M.D., for consultation, and to John H. Flinn, M.D., Director, University Health Service, for consultation and services related to the welfare of the experimental subjects.

meprobamate + 5 mg Dexedrine[2] and a total of 156 placebo determinations (two for each *S*). The authors' work on this combination antedated a commercial interest in it as an appetite suppressant and was motivated by an interest in its possible mood improvement effects.[3]

B. PROCEDURES

In each of four experiments, college student *S*s, 21 years or older, served for a number of sessions, these sessions being separated by two or more days. On each day the *S* came twice, once in the late morning when he filled out report forms, completed a free-choice Adjective Check List (ACL), and took his medication; and again two hours after medication to report on the two "outpatient" hours and to complete a free-choice ACL and a forced-choice ACL. The method was modified double-blind (3, p. 197). A number of drugs and placebo were included in each study, while different *S*s were assigned to different drug sequences in order to counterbalance possible variable factors. *S*s came to the laboratory individually. In each experiment there was a minimum of two initial placebo sessions whose data were not used and which are not counted in the numbers of sessions listed below. Details appear in earlier papers (1, 3). A special point of method is the precautions for attitudinal control (5, p. 219-220). All *S*s completed all scheduled sessions. Table 1 summarizes the variables in each experiment. In each study, all treatments were given in identical capsules.

C. RESULTS

1. *Results from the Short, Forced-Choice ACL*

a. Introduction. The short, forced-choice ACL (3) was first used with college-student *S*s in 1958. It has been modified slightly and in its latest form consists of 32 pairs of adjectives arranged in alphabetical order: i.e., active—energetic, angry—annoyed, anxious—fearful, etc. It is administered in each posttreatment session. The *S* is required to make a judgment for each pair of adjectives of ". . . whether you felt more that way before the drug took effect or whether you feel more that way now." This is done by circling either

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[2] Although the writers were unaware of it at the time this work was done, a combination of 400 mg meprobamate plus 5 mg dexedrine is marketed under the name Appetrol, and is intended for appetite control. This is a Wallace Pharmaceutical product.

[3] No literature pertinent to the effects of combinations of meprobamate and amphetamine on moods, emotions, and motivations has been found. Three papers dealing with its efficacy as a drug for appetite control mention "side effects." Since these are recorded only when a patient complains, they give a distorted and incorrect impression of the true effects on the average subject. These papers were published by S. Kreinin, 1961, R. C. Batterman, 1964, and P. L. Rodensky, 1961.

TABLE 1
LISTING OF THE VARIABLES FOR THE FOUR EXPERIMENTS

Inclusive dates of each experiment	*N*	Sex	Number and nature of experimental sessions						
			Total	Placebo	I	II	III	IV	V
1958, Feb. 28—April 29	30	M	11	3	1 600 mg mep. + 10 mg Benz.	4	1	1	1
1959, Mar. 23—May 28	36	M	13	2	1 600 mg mep. + 10 mg Benz.	1	1	2	6
1964, Oct. 5—Feb. 5, 1965	39	M	12	2	1 400 mg mep. + 5 mg Dex.	1	1	1	6
1965, Feb. 2—May 10	39	F	14	2	1 400 mg mep. + 5 mg Dex.	1	2	2	6
Total	144		50	9	4	7	5	6	19

Note: Column I = Meprobamate + amphetamine, Column II = Meprobamate, Column III = Amphetamine, Column IV = Dramamine, and Column V = Other.

the word "before" or the word "now" adjacent to the adjective pair. In addition, *S*s answer three other questions:

Which way of feeling did you like better? Before Now
Do you believe that you felt any drug effects today?
None—— Slight—— Moderate—— Strong——
Completing this list today was:
Difficult—— Moderately difficult——
Moderately easy—— Easy——

Except for the last two items, the data yielded by this ACL consist of frequencies of choice, for each item, of "before" or of "now." They, therefore, yield a quantitative statement of the proportion of *S*s who made each choice after each treatment condition.

b. Placebo results on the forced-choice ACL. The 33 items of the ACL have been rearranged into two major divisions: the first 16 items are normally associated with positive emotional states, the second group of 16 items are normally associated with negative states. One item, intoxicated—light-headed, is separate because it can be associated with either positive or negative changes and is most often used by subjects to reflect the degree to which they feel affected by a drug.

Table 2 presents the results for the two meprobamate-amphetamine combinations, each with its matching placebo results, drug-placebo differences, and "student" *t*'s. (Four items are missing from one set of results, since they were not included until the 1963 revision of the ACL.)

The two sets of placebo results are typical for the present authors' series of experiments (1, pp. 102-104) and show for two rather large numbers of determinations how *S*s judged themselves as feeling after lunch as compared to before lunch. Statistically, the ideal outcome for placebo data would be that, randomly, 50 per cent of the *S*s would feel better and 50 per cent worse, if it is assumed that they were exposed to a static two-hour interval. With only two exceptions, all items for the two placebos are included within the range, 50 per cent ± 10 per cent, with the majority falling between 45 per cent and 55 per cent. Both sets show a slight shift (away from 50 per cent random chance) toward a relaxed positive mood and away from the negative emotions—a reasonable result from the influence of two hours of time in the middle of the day including a sociable on-campus lunch.

c. Meprobamate-amphetamine combination results on the forced-choice ACL. Since 10 mg Benzedrine is believed to be equivalent to 5 mg Dexedrine, the difference between the two combinations is the amount of meprobamate, 600 mg and 400 mg. Rather than combining the two highly correlated sets of results as though they were a single drug treatment, the authors were interested in determining whether a sensitive methodology employed on two different groups of similarly selected and trained *S*s would yield demonstrable and reasonable differences.

Both combinations were very positively and comfortably received, as is indicated by higher percentages for positive emotional states and lower percentages for negative items, when compared with placebo. Inspection of the per cent columns for the two combinations, however, clearly indicates that the principal difference between them is that the 400 mg combination yielded a more positive emotional state than did the 600 mg combination, with very little sacrificed by lowering the amount of the tranquilizer. (Easygoing—relaxed and quiet—peaceful are higher, and impatient—snappish and jittery—nervous are lower after the 600 mg combination than after the 400 mg combination.) The minor disadvantages (which are still better than or equal to placebo) are definitely outweighed by the substantial differences for such items as industrious—work-oriented: 59 per cent after 600 mg and 81 per cent after 400 mg; drowsy—sleepy: 44 per cent and 24 per cent, respectively; dull—sluggish: 39 per cent and 21 per cent; and tired—washed-out: 45 per cent and 22 per cent.

2. *Results from the Long, Free-Choice ACL*

a. Introduction. The free-choice ACL consists of 133 adjectives alphabetically listed—i.e., active, affectionate, agreeable, ambitious, etc.—in vertical columns. The *S* checks or double-checks each adjective that describes his feelings at that time. The free-choice ACL is completed twice by the *S*, once before and once two hours after drug, yielding a *change score* for each of the adjectives, which can then be totalled for the group of *S*s.

b. Change scores after placebo. The placebo data are similar to what the authors have reported elsewhere (1, pp. 115-117; 4, pp. 269-274). The only consistent pattern, other than random changes, is that of postlunch relaxation with a small increase in check marks for such adjectives as drifting, lackadaisical, leisurely, and a decrease in check marks for ambitious, confident, optimistic.

c. Change scores after meprobamate-amphetamine combination. Table 3 lists the total changes in number of check marks from before drug treatment to after drug treatment for each of 133 adjectives. The list is in rank order from the adjective that increased most to the one that decreased most. In order to afford the reader a simple overview or profile of what the effects of the combination are, the results of the two dose levels have been combined in this instance and represent data from 144 *S*s. (See section below, *Total change*

TABLE 2
FORCED-CHOICE ADJECTIVE CHECK LIST: DATA ON TWO MEPROBAMATE-AMPHETAMINE COMBINATIONS AND MATCHING PLACEBO TREATMENTS

	600 mg meprobamate + 10 mg Benzedrine and matching placebo				400 mg meprobamate + 5 mg Dexedrine and matching placebo			
Adjective pair	% "nows" after placebo ($N = 162$)	% "nows" after mep. + Benz. ($N = 66$)	Diff.	t	% "nows" after placebo ($N = 156$)	% "nows" after mep. + Dex. ($N = 78$)	Diff.	t
1. active—energetic	52	67	+15	+2.14	58	79	+21	+3.46
2. cheerful—happy	53	73	+20	+2.97	54	79	+25	+4.10
3. decisive—capable	54	74	+20	+3.00	61	86	+25	+4.51
4. easygoing—relaxed	53	80	+27	+4.29	58	71	+13	+2.01
5. egotistic—boastful	49	68	+19	+2.73	50	72	+22	+3.40
6. effective—efficient	51	71	+20	+2.93	58	81	+23	+3.87
7. genial—friendly	56	74	+18	+2.70	57	86	+29	+5.20
8. humorous—witty	50	68	+18	+2.59	48	77	+29	+4.66
9. industrious—work-oriented	56	59	+ 3	n.s.	57	81	+24	+4.03
10. optimistic—high-spirited[a]					53	85	+32	+5.63
11. quiet—peaceful	57	65	+ 8	n.s.	55	50	— 5	n.s.
12. reckless—uninhibited[a]					49	73	+24	+3.74
13. self-confident—courageous	49	76	+27	+4.11	56	81	+25	+4.19
14. sympathetic—considerate[a]					55	71	+16	+2.46
15. talkative—chatty	47	70	+23	+3.35	47	71	+24	+3.69
16. which way better[a]					56	83	+27	+4.64
17. intoxicated—light-headed	49	76	+27	+4.11	49	67	+18	+2.70
18. angry—annoyed	46	23	—23	—3.54	39	21	—18	—2.98

TABLE 2 (*continued*)

Adjective pair	600 mg meprobamate + 10 mg Benzedrine and matching placebo				400 mg meprobamate + 5 mg Dexedrine and matching placebo			
	% "nows" after placebo ($N = 162$)	% "nows" after mep. + Benz. ($N = 66$)	Diff.	t	% "nows" after placebo ($N = 156$)	% "nows" after mep. + Dex. ($N = 78$)	Diff.	t
19. anxious—fearful	43	27	—16	—2.38	40	21	—19	—3.14
20. bored—uninterested	46	32	—14	—2.01	45	19	—26	—4.36
21. confused—disorganized	41	30	—11	n.s.	42	23	—19	—3.07
22. disturbed—upset	48	23	—25	—3.85	40	23	—17	—2.76
23. downhearted—sad	45	27	—18	—2.68	44	18	—26	—4.41
24. drowsy—sleepy	56	44	—12	n.s.	43	24	—19	—3.04
25. dull—sluggish	56	39	—17	—2.37	42	21	—21	—3.46
26. gloomy—blue	49	26	—23	—3.44	46	15	—31	—5.46
27. grouchy—irritable	49	26	—23	—3.44	42	21	—21	—3.46
28. impatient—snappish	47	26	—21	—3.15	43	28	—15	—2.33
29. jittery—nervous	44	29	—15	—2.20	47	35	—12	n.s.
30. pain—discomfort	48	23	—25	—3.85	46	21	—25	—4.10
31. resentful—indignant	43	23	—20	—3.09	46	23	—23	—3.70
32. self-conscious—timid	44	29	—15	—2.20	40	17	—23	—3.98
33. tired—washed-out	54	45	— 9	n.s.	45	22	—23	—3.74

[a] These items were not included in the list until 1963. Where entries do occur, the percentage was computed on the N available from 1963 on.

scores for a priori clusters, for comparison between dose levels.) The entire list of 133 adjectives neatly sorts into two major divisions: most of the positive or desirable adjectives show an increase in check marks and most of the negative adjectives show a decrease in check marks.

TABLE 3
FREE-CHOICE ADJECTIVE CHECK LIST: RANK ORDER FOR 133 ADJECTIVE CHANGE SCORES
(Meprobamate-amphetamine combination, $N = 144$)

+35	enthusiastic
+33	eager
	friendly
+31	ambitious
	energetic
+30	effective
+29	cheerful
	talkative
	vigorous
+28	carefree
	contented
	happy
	sociable
+27	satisfied
+26	active
	easygoing
	good-natured
	optimistic
+24	genial
	light-headed
+23	relaxed
+21	decisive
+20	affectionate
	creative
	warm-hearted
	self-confident
+19	masterful
+18	amused
	generous
	uninhibited
	witty
+17	agreeable
	dominating
	elated
	engrossed
+16	assertive
	enterprising
+15	efficient
	hard-working
	joyous
	leisurely
	trustful
+14	confident
+13	cooperative
	excited
	industrious
	patient
+12	keyed-up
+11	nonchalant
	obliging
	task-involved
+10	boastful
	intoxicated
	kindly
+ 9	dizzy
	dreamy
+ 8	attentive
	forceful
	reckless
+ 7	peaceful
	work-oriented
+ 6	mischievous
+ 5	business-like
	egotistic
	resourceful
	sarcastic
+ 4	languid
	willful
+ 3	apathetic
	drifting
	fearless
+ 2	emotional
+ 1	drowsy
0	angry
	sluggish
	stomach-ache
	tame
	weak
— 1	changeable
	guilty
	jittery
	lackadaisical
	lazy
	self-conscious
	self-contained
— 2	defiant
	quiet
	rebellious
— 3	bored
	impatient
	nauseated
	weary
— 4	belligerent
	brooding
	hostile
— 5	shy
	uneasy
— 6	sad
	upset
	worried
— 7	headache
	indifferent
	remorseful
— 8	calm
	suspicious
— 9	apprehensive
—10	blue
	confused
	detached
	lonely
	skeptical
	sleepy
	withdrawn
—11	cautious
	dull
	irritable
	nervous
	silent
	unhappy
—13	dubious
	washed-out
—15	careful
	depressed
	downhearted
—16	disturbed
	subdued
—18	annoyed
—19	doubtful
	tired
—20	dissatisfied
—22	close-mouthed

d. Total change scores for a priori clusters comparing the two combinations. The long ACL has been divided into 12 groups of adjectives, selected to represent meaningful emotional and motivational states (1, p. 108). (Needless to say, it is an easier task to compare 12 cluster scores for two treatments rather than to compare 133 change scores for individual adjectives. For further simplicity, the two sets of placebo results have been combined into a total of 318 determinations.) Table 4 presents key adjectives for each cluster, the number of adjectives in each, and the total change score for placebo (318 determinations adjusted proportionately for an N of 78), for 600 mg meprobamate + 10 mg Benzedrine (N of 66 adjusted proportionately to $N = 78$), and for 400 mg meprobamate + 5 mg Dexedrine ($N = 78$). The 12 clusters have arbitrarily been arranged in rank order from the cluster that increased most to the one that decreased most for the combination containing 600 mg meprobamate. Figure 1 shows the same data graphically.

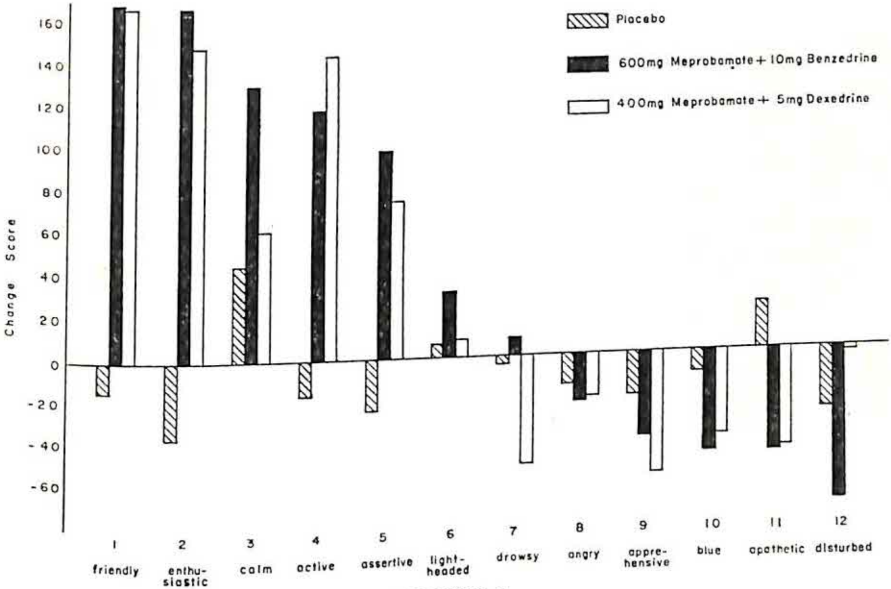

FIGURE 1

Total Change Scores in *a Priori* Clusters After Placebo ($N = 318$ Adjusted to $N = 78$), 600 mg Meprobamate and 10 mg Benzedrine ($N = 66$ Adjusted to $N = 78$), and 400 mg Meprobamate and 5 mg Dexedrine ($N = 78$)

The sensitivity of the methodology is confirmed by the *reasonableness* of the differences: the combination with the higher dose of meprobamate causes *S*s to check with a higher frequency the adjectives in the calm, relaxed cluster (#3), or, conversely, decreases checking frequency in the disturbed, nervous cluster (#12); the combination with the lower dose of meprobamate causes *S*s to check with a higher frequency the adjectives in the active cluster (#4) and with a lower frequency the adjectives in the drowsy cluster (#7). Again, both combinations have a very definite and positive contrast with postplacebo results.

TABLE 4
FREE-CHOICE ADJECTIVE CHECK LIST
(Total change scores in *a priori* clusters: Placebo, 600 mg meprobamate + 10 mg Benzedrine, and 400 mg meprobamate + 5 mg Dexedrine)

Type of adjective and number of adjectives in cluster	Placebo ($N = 318$ adjusted to $N = 78$)	600 mg meprobamate + 10 mg Benzedrine ($N = 66$ adjusted to $N = 78$)	400 mg meprobamate + 5 mg Dexedrine ($N = 78$)
1. Friendly, good-natured, trustful, warm-hearted (17)	—13	+168	+165
2. Elated, enthusiastic, self-confident, uninhibited (14)	—36	+165	+147
3. Calm, dreamy, drifting, relaxed (14)	+44	+130	+ 60
4. Active, ambitious, energetic, industrious (13)	—16	+117	+143
5. Assertive, decisive, egotistic, boastful (12)	—23	+ 97	+ 73
6. Light-headed, dizzy, headache (6)	+ 6	+ 30	+ 8
7. Drowsy, lazy, sleepy, sluggish (8)	— 3	+ 7	— 51
8. Angry, belligerent, defiant, sarcastic (9)	—14	— 22	— 20
9. Apprehensive, careful, self-conscious (9)	—19	— 39	— 58
10. Blue, depressed, guilty, unhappy (9)	—10	— 48	— 39
11. Apathetic, bored, indifferent, withdrawn (11)	+21	— 48	— 46
12. Disturbed, nervous, uneasy, upset (11)	—28	— 71	— 2

3. *Comparison of Meprobamate-Amphetamine Combination with Its Separate Components*

The nature of the effects of the meprobamate-amphetamine combinations on 21-year-old college students is a very positive elevation of moods, emotions, and motivations. A comparison of previously reported data on meprobamate (3) and amphetamine (2) with those of the combinations indicates that the effects of the combinations in no way resemble the effects of meprobamate alone, but rather a reversal of mood states suggesting an enhancement of amphetamine effects without the disadvantage of nervousness and uneasiness.

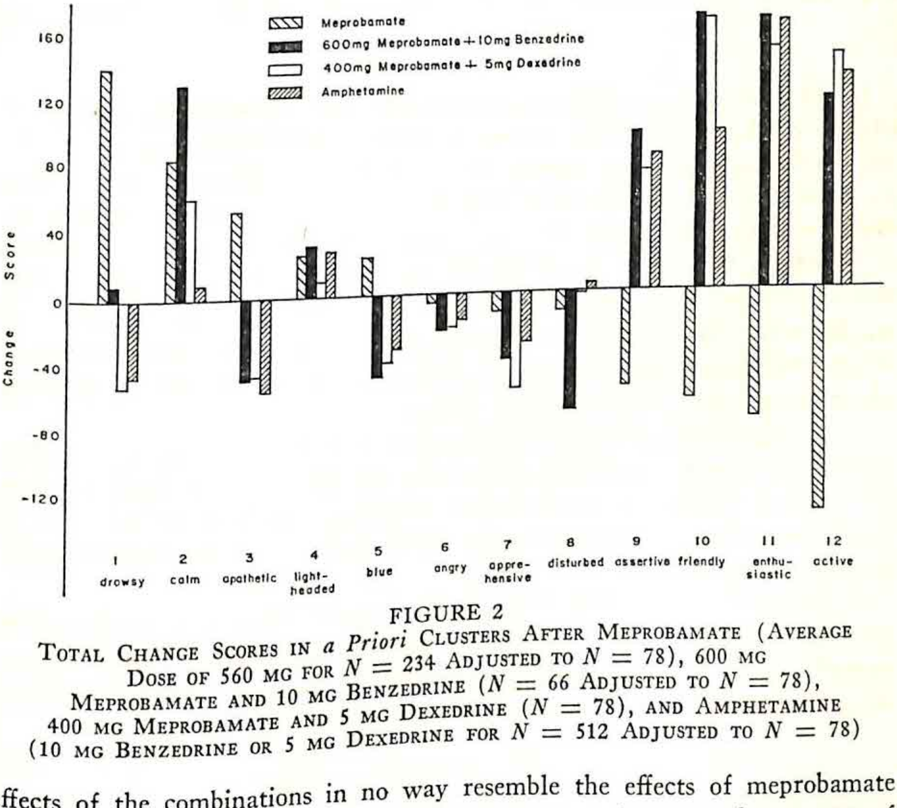

FIGURE 2

Total Change Scores in *a Priori* Clusters After Meprobamate (Average Dose of 560 mg for $N = 234$ Adjusted to $N = 78$), 600 mg Meprobamate and 10 mg Benzedrine ($N = 66$ Adjusted to $N = 78$), 400 mg Meprobamate and 5 mg Dexedrine ($N = 78$), and Amphetamine (10 mg Benzedrine or 5 mg Dexedrine for $N = 512$ Adjusted to $N = 78$)

The two outstanding effects of meprobamate on 21-year-old *S*s are a large increase in drowsiness and an equally large reduction in activity. The combinations reverse these effects and, apparently, when the subjects are not slowed down or annoyed by drowsiness, they combine the good effects of both compounds and achieve an attractive result: the meprobamate affords relaxation and a reduction of nervousness and apprehension; the amphetamine contributes outgoing behavior, friendliness, enthusiasm and a reduction of apathy and depression.

Figure 2 is a bar graph of the 12 *a priori* clusters and presents a convenient comparison of meprobamate, 600 mg meprobamate + 10 mg Benzedrine, 400 mg meprobamate + 5 mg Dexedrine, and amphetamine. The *N*s of the four treatments have been adjusted to $N = 78$ to facilitate comparisons. The 12 clusters in this instance have been arranged in the rank order of the meprobamate results, from that cluster increasing most to that decreasing most.

D. COMMENTS

1. Two meprobamate-amphetamine combinations had strong positive effects on normal subjects, increasing activity, friendliness, enthusiasm, and relaxation; and decreasing depression, apathy, and apprehension. The combination with the higher dose of meprobamate decreased nervousness, while that with the lower dose decreased drowsiness, as compared to placebo or to one another.

2. Results from 78 *S*s receiving 400 mg meprobamate + 5 mg Dexedrine were more positive than those from 66 *S*s receiving 600 mg meprobamate + 10 mg Benzedrine due to the fact that the latter elicited the greater frequency of reported drowsiness and tranquilization, two emotional states not ideally acceptable to active, normal young adults.

3. A comparison of the two combinations with meprobamate and amphetamine administered separately indicates that the combination had effects generally opposite to those of meprobamate and more nearly resembled those of amphetamine, but without its increase of nervousness and decrease of relaxation and calmness.

4. The data serve to demonstrate again the methodological point that, given active compounds or combinations, the procedures produce sensitive and apparently valid assessments of drug actions on emotional and motivational states, and that the administration of placebo has little effect.

E. SUMMARY

Four experiments with a total of 144 normal college student *S*s, 21 years or older, describe the effects of two meprobamate-amphetamine combinations on moods, emotions, and motivations as determined by free-choice and forced-choice Adjective Check Lists.

Drug-placebo comparisons indicate that both combinations, 600 mg meprobamate + 10 mg Benzedrine and 400 mg meprobamate + 5 mg Dexedrine, were very positively received by the *S*s who became more enthusiastic, friendly,

work-oriented, and decisive; and simultaneously less depressed, apprehensive, apathetic, and nervous.

The methodology was sufficiently sensitive to discriminate between the combinations: the higher dose of meprobamate produced the higher frequency of drowsiness, relaxation, and a reduction of nervousness. It was less preferred by the subjects than the lower dose.

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(Manuscripts are printed in the order of final acceptance)

A note on spontaneous instrumental responding as a function of differential levels of drive and effort 185
By Devendra Singh

Learning and retention of a light contingent bar press response for three inbred strains of mice 191
By Charles L. Goodrick

Simultaneous electrical recording of independent and summated eye movements 201
By J. W. Wolfe and G. R. Wendt

Free-operant avoidance of stimuli associated with high fixed-ratio reinforcement 205
By David A. Gibson

GSR as a measure of the sexual component in hysteria 211
By Brian T. Jordan and Joel R. Butler

Correlational and normative data for the progressive matrices with retarded populations 221
By Harry E. Anderson, Jr., Frank E. Kern, and Charlotte Cook

(OVER)

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Published at 35 New St., Worcester, Mass.
Second-class postage paid at Worcester, Mass.
Send all mail to Managing Editor, 2 Commercial Street, Provincetown, Massachusetts

Affective dimensions in connotative meaning in reading 227
By William F. White, Albert J. Kingston, and Wendell W. Weaver

Self-acceptance: Some anxiety and cognitive style relationships 235
By Fred W. Ohnmacht and James J. Muro

Birth order and PPS affiliation 241
By L. K. Waters and William E. Kirk

Preferences on the perceptual reaction test as a function of sex, school grade, and race 245
By John R. Stabler, Jean Spruill, and Dale Eakin

Sex differences in the perception of academic achievement among elementary school children 249
By Edward T. Clark

Effects of placebo and an acetaminophen-salicylamide combination on moods, emotions, and motivations 257
By Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt

Effects of dramamine-analgesic-caffeine combination on moods, emotions, and motivations 263
By Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt

Learning and retention as a function of instructional method and race . . 271
By John R. Stabler and Oliver B. Perry

Congruence of the dimensions of self-as-object and self-as-process . . . 277
By R. Robert Rentz and William F. White

Sampling of redundant cues in a successive discrimination problem . . . 287
By B. R. Hergenhahn, Gerald Otis, Jack Capehart, and Charles Myers

Probability learning in children as a function of age, magnitude of incentive, and percentage of reinforcement 293
By John R. Stabler

Replication of an investigation of concepts expressed by the term "true" as stated by experimental and clinical psychology students 299
By Helen Zimnavoda, Joseph G. Phelan, and John M. Darcy

Concept learning in schizophrenics and normals: Selection and addition of cues; effect of amount and type of memory information 303
By Joseph G. Phelan, Harriet C. Levy, and Jack W. Thorpe

Personality and family background correlates of students' response to physical danger 313
By John R. Stabler and Ann H. Goodrich

Student "gullibility": A systematic replication 319
By K. A. Lattal and Alice D. Lattal

Desensitization and reduction in cigarette consumption 323
By Tom Kraft and Ihsan Al-Issa

Complexity-simplicity, creativity, intelligence, and other correlates . . . 331
By Russell Eisenman and Nancy Robinson

A note on a new test of creativity 335
By Marvin Karlins

Medicare: A disaster for the aged psychiatric patient? 341
By Bernard A. Stotsky, Joan R. Dominick, Joel Pearlman, and Daniel L. Greenblatt

Published as a separate and in *The Journal of Psychology*, 1967, **67**, 185-189.

A NOTE ON SPONTANEOUS INSTRUMENTAL RESPONDING AS A FUNCTION OF DIFFERENTIAL LEVELS OF DRIVE AND EFFORT*

Department of Psychology, North Dakota State University

DEVENDRA SINGH

A. INTRODUCTION

Many studies have demonstrated that animals will execute a specific instrumental response—for example, bar pressing—without any experimental conditioning [e.g., Murray (5), Roberts (6), and Segal (8)]. This preconditioning rate of responding has been termed "operant level" by Schoenfeld *et al.* (7), who have also clearly elucidated the purpose and value of measuring operant level in conditioning experiments employing a Skinner Box.

One purpose of the present investigation was to ascertain the effect of varying food deprivation on the operant level of responding in the Skinner Box. Furthermore, since most of the commercially available Skinner Boxes require different amounts of force to depress the bar fully (range 10 grams to 22 grams), the second purpose of the study was to investigate the effect of the amount of force required to press the bar on the operant level and the interaction of this variable with the drive state.

B. METHOD

1. *Apparatus*

The equipment consisted of three identical operant conditioning chambers constructed of clear ¼-inch plexiglass, each surrounded by a sound-insulated enclosure. The chamber (12 inches high × 12 inches wide × 9.5 inches wide) was equipped with a retractable lever (¾ inch wide × ¼ inch thick) which was located 4¼ inches above the floor, 3 inches from a side wall, and protruded into the box ½ inch. The bar was adjustable so as to require 11, 22, or 44 grams force to depress fully. A food cup (1 inch diameter) was attached 2 inches above the floor and 2 inches beneath the bar. A 3-inch exhaust fan was mounted on the side of the box and, in addition to producing masking noise, drew air from a 2-inch aperture located on the side wall of the chamber.

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Bar presses were automatically recorded on counters and an electronic timer retracted the bar after the completion of the experimental session.

2. *Subjects*

The *S*s were 108 male Long Evans hooded rats, 200-225 grams in weight upon receipt at the laboratory.

3. *Procedure*

Upon arrival at the laboratory, *S*s were placed in individual cages and kept on an *ad libitum* food and water schedule for four days. On the fifth day all animals were placed on a two-hour daily feeding schedule (9 AM—11 AM). After the feeding schedule, all food was removed from the cages. Water was available in the cages at all times. Also starting on the fifth day, all animals were handled for five minutes a day following the feeding period. All the animals were adapted to the handling and feeding schedule for 10 days. On the eleventh day, animals were randomly assigned to the experimental conditions. The design was a 3×3 factorial incorporating 11, 22, or 44 grams force on the bar and four, 10, and 20 hours of food deprivation. Each group consisted of 12 animals.

All animals were tested for 15 minutes a day for three days. The use of a short experimental session was based upon the study by Schoenfeld *et al.,* who found predominantly zero responses in later intervals using an hourly session. For testing, bar weight was prearranged according to experimental conditions, the animal was placed in the box, and the number of bar presses recorded. Each bar press produced the sound of the food delivery mechanism; however, no food was delivered. The experiment was conducted in a series of four replications.

C. RESULTS

Since there was a correlation between means and variances among groups, a square-root transformation was performed on the data before subjecting it to an analysis of variance. The result of the analysis on the total number of bar presses by each animal shows that neither the main effects nor deprivation × bar-weighting was significant. However, if data are analyzed for each day separately, there is a tendency, though nonsignificant ($p < .10$), for the group working on the heavier bar to make fewer responses on the first day.

Figure 1 represents the mean number of responses by all the *S*s for each day, ignoring nonsignificant variables. In addition, the figure also presents mean, median, and standard deviation for each day. Two trends are evident: first, a daily decrease in the variability across the days of testing; and, second, the usual extinction-like shape of the curve.

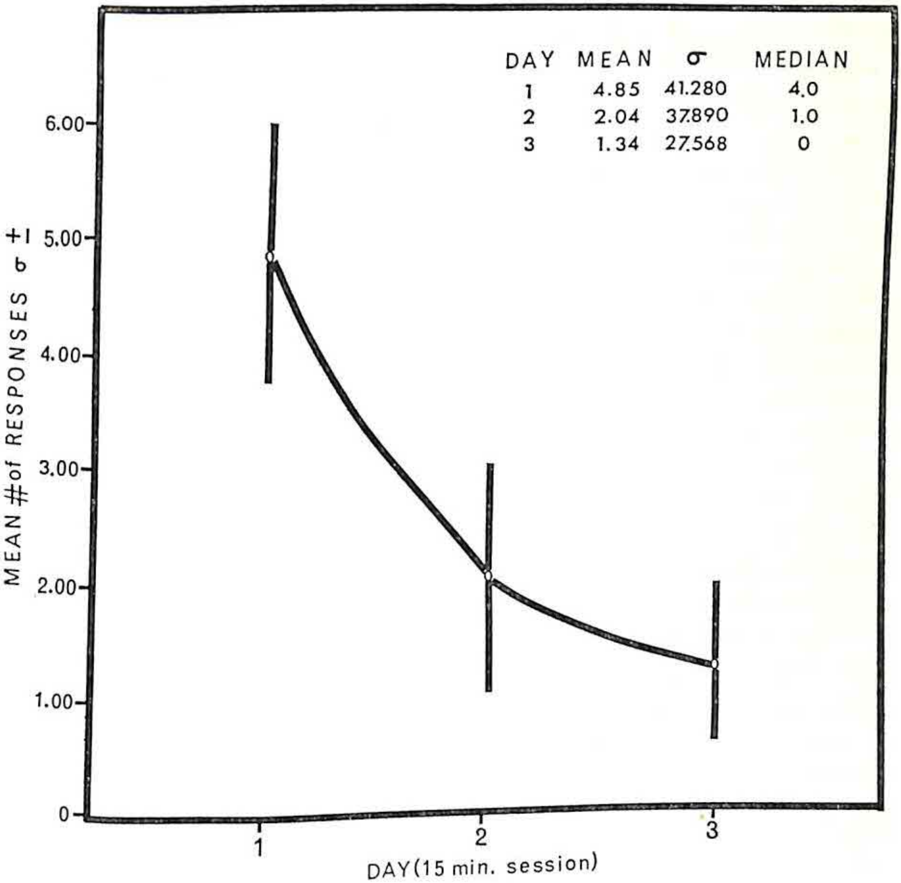

FIGURE 1

Total Number of Responses Emitted by All 108 *S*s in Three Days of Testing
Vertical line represents sigmas.

To check the stability of the operant level of an animal across days, Pearsonian intercorrelations were computed. All correlations are positive (day 1 *vs.* 2 = .75, day 1 *vs.* 3 = .41, and day 2 *vs.* 3 = .37) and indicate a shift in the relative position from day to day.

D. Discussion

The present findings that operant level of responding is not affected by the deprivation state of the animal are consistent with Segal (8) and with Murray's short bar condition (5). However, most of the studies using other measures of activity find a positive relationship between deprivation and activity level [see Baumeister *et al.* (1)]. The only explanation which can be offered is suggested by Segal: that is, "deprivation increased the variety of types of operant emitted rather than the number of instances of a given operant class" (8, p. 715).

The most difficult finding to explain is the lack of any effect of differential bar-weighting on operant level. It was expected that operant level under lighter bar would be greater than operant level under heavier bar, mainly because the occurrence of tangential responses (accidental bar presses) is more probable under this condition than any other. Furthermore, on the basis of the Hullian postulate of work (3), a greater operant level was expected for lighter bar condition. The author has no explanation for this finding.

The extinction-like function obtained over three days of testing is in agreement with previous studies [Roberts (6), Schoenfeld *et al.* (7)]. This progressive decrease over days of testing, though the stimulus conditions remained constant, rules out any explanation based on sensory reinforcement [see Kish (4)]. However, this progressive decrease in performance, in spite of unaltered stimulus conditions, can be readily explained by Berlyne's theory of curiosity motivation (2). Broadly paraphrasing, Berlyne states that in a novel situation (*a*) behavior that increases stimulation will be reinforced; (*b*) after a time exploration will cease; and (*c*) after a further lapse of time the animal will explore again, but less than the first time. Thus, on the first day of testing, the box and especially the bar (the only protruding object) constitute a curiosity-arousing stimulus which, as testing progresses, loses its effect; hence, a progressively decreasing number of responses are recorded on second and third days.

E. SUMMARY

The purpose of the study was to ascertain how operant level of responding in a Skinner Box is affected by deprivation state and different amounts of effort required to execute the response. One hundred and eight *S*s were tested daily for 15 minutes for three days. The analysis of the responses emitted showed that operant level of responding was unaffected by either of the factors. The obtained results are discussed in terms of Berlyne's Theory of the Curiosity motive.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 191-199.

LEARNING AND RETENTION OF A LIGHT CONTINGENT BAR PRESS RESPONSE FOR THREE INBRED STRAINS OF MICE*

Gerontology Branch, National Institutes of Health, Bethesda, Maryland, and the Baltimore City Hospitals

Charles L. Goodrick

A. Introduction

A variety of data is now available concerning behavioral differences among inbred strains of mice so that various strains may be placed on a continuum ranging from low to high for diverse traits. The C57, C3H, and A strains are ranked identically on wheel activity (2), alcohol preference (3), hoarding (9), and "exploratory" activity (16). C57 mice were ranked high on all measures, A strain mice lowest, and C3H mice were intermediate on all measures. The present experiment was designed to show strain differences in operant level, performance during a series of light contingent bar press (LCBP) sessions, and performance during extinction sessions. Through these tests it was possible to test hypotheses concerning the order of behavioral relations of the three genetically different strains. A behavioral continuum ranging from high to low was suggested on the basis of the above data with the strains in the following order: (*a*) C57, (*b*) C3H, (*c*) A.

B. Method

1. *Subjects*

The mice were obtained from the Jackson Laboratory at Bar Harbor, Maine, at the age of one month. Strains were A/J, C3HeB/FeJ, and C57BL/6J, designated throughout this paper as A, C3H, and C57. Only females were used within these experiments. They were housed, four per cage, in 7 × 10-inch stainless steel cages with sanicel bedding and food and water *ad lib.* The mice were always handled by the tail and marked on the tail with red dye for identification. At the initiation of the experiment the animals were four months old. There were 24 mice of each strain in each experimental group.

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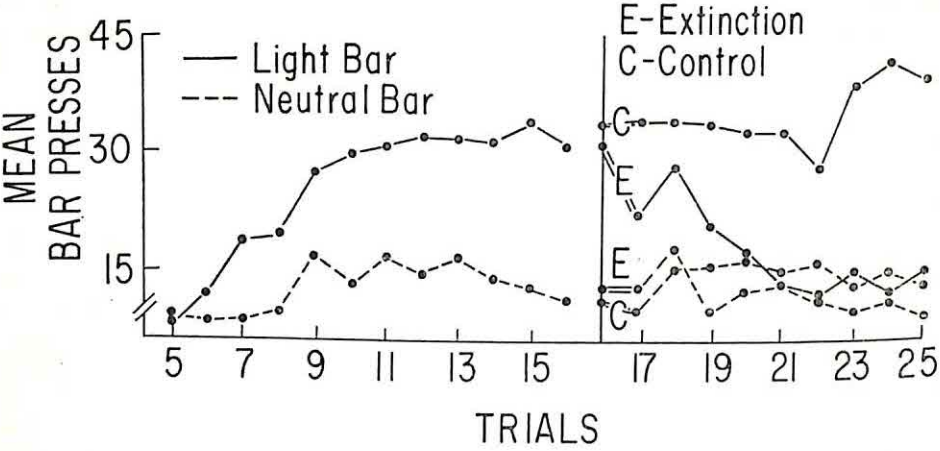

FIGURE 1
LEARNING AND RETENTION OF A LIGHT CONTINGENT BAR PRESS BY A/J FEMALE MICE

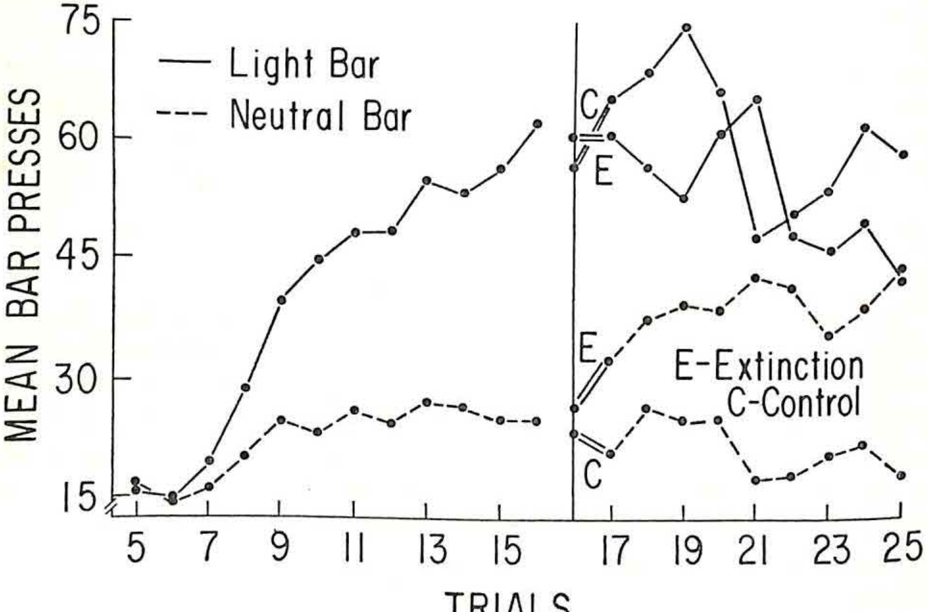

FIGURE 2
LEARNING AND RETENTION OF A LIGHT CONTINGENT BAR PRESS BY C57BL/6J FEMALE MICE

2. *Apparatus*

Rat cages were utilized as test chambers. The area was 5 × 8 inches and five inches high with ½-inch wire mesh front and bottom. Two Lehigh Valley mouse bars (#1535) were fastened firmly one inch above the bottom of the cage to the front section equidistant from the sides with two inches between them. A 24 V.D.C. Lamp that produced a light intensity of about 15 ftc was attached to a solid wooden top at the front of the cage equidistant between the bars. When the light contingent bar was pressed, a timer turned the lamp on for two seconds, and responses were cumulated on counters activated by pulse formers. The test chambers were placed within a light-shielded transfile cabinet. Four chambers were used throughout the tests during which a white-noise generator was utilized to mask extraneous sounds and relay-timer noise.

3. *Procedure*

The experiment was run over a 25-day period with trials lasting 30 minutes and each mouse individually tested. All mice were initially run on four preliminary operant level trials. On the following day *S*s were randomly assigned to one of the four test chambers within which one bar was made light contingent. After 12 consecutive LCBP trials, each group of 24 mice was split by matching response rates on Trials 11 and 12 (mean rate is given on the center solid line of Figures 1 and 2). Twelve subjects of each mouse strain continued training, while 12 matched mice underwent extinction. Each of these groups was run for nine additional trials.

C. RESULTS

Repeated measures analyses of variance were computed for all tests. Generally, the level of probability used for statistical significance was $p < .01$. The computations were done in the manner suggested by Winer (17).

Differences between strains for responses during operant level tests were statistically significant ($F = 9.80$, $df = 2/69$, $p < .01$). C57 mice were highest in operant level bar pressing, with the A strain second and the C3H strain lowest. Operant level decreased as a function of trials for all strains

TABLE 1

	TRIALS			
Strain	1	2	3	4
C57	44.8	28.7	23.8	23.5
A	26.5	25.9	15.8	13.8
C3H	21.3	10.1	9.7	11.1

Operant level as a function of mouse strain and trials.

($F = 8.83$, $df = 3/207$, $p < .01$). Mean operant level scores are given in Table 1.

1. *LCBP* (*Training, Totals, Trials 1-12*)

Total responses increased for all mouse strains as a function of training trials ($F = 30.01$, $df = 11/759$, $p < .01$). For A and C57 mice, the greater number of responses was made on the light contingent bar with the maximum difference occurring after initial light contingent sessions. Although a number of C3H mice increased response rates, no consistent preference for the light contingent bar emerged for 23 of the 24 *S*s. Total rates of responding were of the same order as during operant level with strain differences highly statistically significant ($F = 17.43$, $df = 2/69$, $p < .01$). However, this must be interpreted in relation to the significant second-order interaction ($F = 10.43$, $df = 22/759$, $p < .01$) as discussed above (see Figures 1 and 2).

In order to obtain a measure of the reliability of the data, A and C57 Trial 12 training total scores were randomly split, so that an analysis of variance could determine effects due to sampling. The analysis of variance was a 2 × 2 design, strain × replication with $N = 12$ in each group. Strain differences were highly statistically significant ($F = 17.18$, $df = 1/44$, $p < .01$), while replication and interaction effects were nonsignificant (replication $F = .01$, interaction, $F = .48$).

2. *LCBP or Extinction* (*Totals, Trials 13-21*)

Rates of response and preference for the light contingent bar remained fairly constant for A and C57 mice, while for C3H mice response rates dropped, with subjects showing no preference for the light contingent bar. The first-order interactions AB (strain × bar) and AC (strain × trials) were statistically significant due to these relations (AB, $F = 22.42$, $df = 2/33$, $p < .01$; AC, $F = 3.04$, $df = 16/264$, $p < .01$).

Groups run on extinction showed complex differences as a function of strain, bar, and trials (ABC interaction, $F = 2.26$, $df = 16/264$, $p < .01$). Strain A mice decreased in rates of response over trials with a decreasing perference for the light contingent bar (Figure 1). Mice of the C57 strain remained at a high level of responding throughout all extinction trials, but with a decreasing preference for the light contingent bar, while C3H mice decreased in rate of responding with no differences between response rates on the two bars. On Trial 9 of extinction, response differences between A training and extinction groups were statistically significant; $t = 3.41$, $df = 22$, $p < .01$, while differences between the C57 groups were in the reverse direction with $t = .62$,

3. *A and C57 Percentages*

Analyses of variance were also computed to determine possible differences in proportion of responses on the light contingent bar for the A and C57 strain during training and extinction. Such analyses are required to isolate learning from performance differences between highly active C57 and inactive A strain mice. C3H groups remained at 50 per cent levels throughout all tests. The only significant differences were an increasing proportion of light contingent presses over trials ($F = 10.45$, $df = 11/506$, $p < .01$). During extinction trials the proportion of light contingent presses decreased ($F = 3.63$, $df = 8/176$, $p < .01$), while strain differences were nonsignificant. Proportion of light contingent presses are given for all strains during the 25 trials in Figure 3.

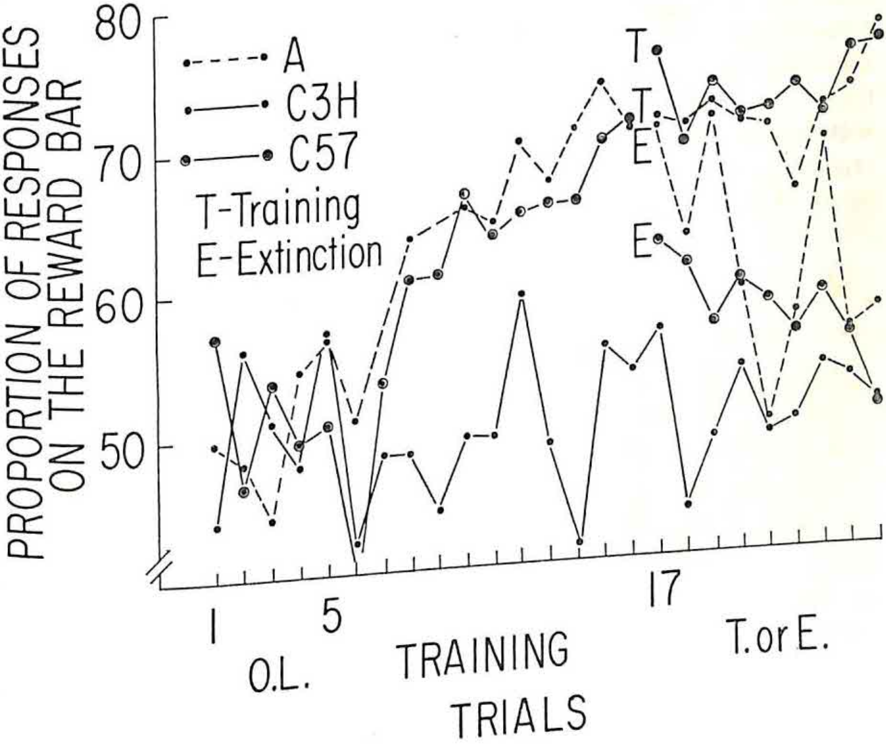

FIGURE 3
Proportions of Responses on the Reward Bar During Operant Level Tests (T1-4), LCBP Tests (T5-16), and Retention Tests (T17-25) for A, C3H, and C57 Inbred Female Mice

D. Discussion

In general, the hypothesis that C57, C3H, and A strain mice form a behavioral continuum from high to low was not substantiated. However, for two strains, C57 and A, the expected relations were obtained for total rates of response during all sessions. Just after collection of the present data, Sidman and Greene (14) published data concerning an inherited retina abnormality named retinal degeneration, *rd*. Mice with this gene apparently have little light sensitivity: "Rods attain no more than a fraction of their normal length and then the whole photoreceptor cell degenerates progressively so that by 20 days the retina has intact ganglion cells and bipolar layers but virtually no photoreceptor layer" (14, p. 23). The strain C3HeB/FeJ used in the present study was listed as a stock with histological changes indistinguishable from *rd*, while A/J and C57BL/6J were listed as stocks with histologically normal retinas. The data obtained in this experiment confirm the histological data on the behavioral level by showing no LCBP effect for the C3H strain. Other data showing poorer light discrimination learning and maze learning (1, 13) for C3H sublines as compared with other strains are probably the result of this same visual defect.

In a discussion of the explanation underlying the LCBP effect, Lockard suggests that if LCBPing decreases as a function of trials, then this effect can be dismissed as relatively "trivial" (10, p. 514). However, if an increase in rate is obtained, the effect is similar to the more impressive nutritive reinforcers. Published evidence suggests considerable divergence, although differences may be resolved on the basis of adaptation trials prior to LCBPing.

Adapted animals are expected to respond initially at a high rate, which decreases with trials, while nonadapted animals increase rate of response over trials, according to this interpretation [e.g., see (7)]. Lockard (11) has suggested that the experimental evidence for this hypothesis is inadequate. The data of the present experiment appear not to support either position. That is, after adaptation, there was an increase in mean response rate, reaching an asymptotic level. These data resemble that obtained by Stewart (15) for male hooded rats, except that those rats increased response rates markedly on the first day of training.

A more reasonable hypothesis is that total rates of response over a *long* series of trials is determined by species, strain, or environmental variables such as food deprivation. Some animals, such as the A and C57 mice and hooded rats (15) maintain consistent response rates. Adaptation trials are only relevant in relation to initial rates and proportions of responding. Few studies have run a long enough series of trials to determine just what effect adaptation trials do elicit (8). The present data found that both inactive A strain and active C57 strain mice maintained high response rates and a light contingent bar preference over a long series of trials.

The analyses of extinction data included both proportions of reward responses and total responses. In this way it was possible to isolate total rate of responding and learning factors. Learning was used in the present context to denote an increasing or decreasing probability of pressing one of two bars in the Skinner Box. The decreasing proportion of responses during extinction is related to Hull's construct ${}_{S}I_{R}$, while a decline in total extinction responses is related to I_R (6). ${}_{S}I_{R}$, termed conditioned inhibitory potential, is related to learned decremental aspects of performance during extinction tests, while I_R (reactive inhibition) refers to performance factors, such as fatigue and rate of responding.

In the present experiment, the preference for the reward bar decreased with increasing extinction trials for both strains of mice which learned to make the light contingent bar press. One of the few experiments related to the present study (5) used active and inactive rats. Inactive rats pressed at lower rates and made fewer bar presses during extinction trials. However, there were no statistically significant differences in the means for active *versus* inactive groups in any of the seven extinction trials. In the present experiment, there also was no evidence obtained to suggest a basically different type of extinction behavior, *when response proportions are considered.*

However, in examining total rates of response, during extinction, there are large strain differences. Strain A inactive mice dropped to a lower level of responding in comparison with controls and clearly remained at a low level throughout extinction trials, while C57 strain active mice showed no drop in number of responses during extinction trials. If total rates of responding are related to I_R, then it must be concluded that C57 mice are unaffected by such postulated factors as fatigue and the high rate of response elicited during and after training.

In spite of great differences between these two strains on measures of activity and exploration (12), there were no differences in proportion of light contingent presses between the A and C57 strains during training or extinction. A similar finding for rats (4) indicated that proportions of responses for young and senescent (deprived and nondeprived) rats were highly similar, although differences were obtained in total rates of response. A more involved parametric study in which response rates and proportions are changed by stimulus or response variables would clarify such findings, as would correlational studies of the relations of LCBP to other measures of exploration. The data for the A and C57 groups show that although differences in rates of bar pressing are obtained for the two strains, learning and extinction of the LCBP are essentially the same. The only differences that occur are those involving total rates of response, which may be related to differing base activity levels.

E. Summary

A/J, C3HeB/FeJ, and C57BL/6J female mice were tested in a two-bar Skinner Box for operant level, light contingent bar pressing, and extinction. C3H mice responded at relatively low levels throughout all tests and failed to bar press for light. C57 mice responded at higher rates than A mice during all tests. After operant level tests, the initiation of training with a light contingency on one bar resulted in a persisting increase in bar pressing for strain A and C57, the increase being proportional to strain operant level. Strain A total rate of responding decreased during extinction, while no decrease in total rate of responding occurred in the C57 strain during extinction trials. This was due to a slow rate of extinction on the reward bar operating concurrently with a gradual increase in rate on the nonreward bar over trials for the C57 extinction group. However, no A/J and C57 strain differences were found in performance or extinction when proportions of reward responses were analyzed.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 201-204.

SIMULTANEOUS ELECTRICAL RECORDING OF INDEPENDENT AND SUMMATED EYE MOVEMENTS*[1]

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A. INTRODUCTION

The electro-oculogram (EOG) has been used extensively for accurately recording a variety of eye movements. However, results could often be more readily interpreted by independent records of the right and left eye rather than the conventionally used summated record. For example, there is considerable evidence that the EOG is subject to large variations in amplitude as a function of dark and light adaptation (1, 2, 3, 4). Separate records of a dark-adapted and light-adapted eye taken simultaneously are useful.

B. METHOD

The majority of investigators have used a record summating both eyes when recording horizontal nystagmus. A few have used independent recordings, but at the sacrifice of the summated record. Frequently it is necessary to study independent and summated eye movements simultaneously. In the present study this combined recording method was attempted and found to give satisfactory results with both human *S*s and cats.

In Figure 1 it can be seen that only one additional electrode (the center reference) is required for the independent eye records. The reference electrode is placed on the forehead, above the bridge of the nose; the other electrodes, near the outer canthi of the eyes. If low impedance electrodes, such as Beckman #350059, are used, there is no detectable increase in noise on the summated record. However, the subject must be adequately grounded by a finger or ear electrode.

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* Received in the Editorial Office, Provincetown, Massachusetts, on July 10, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This research was conducted while James W. Wolfe held a United States Public Health Service Predoctoral Research Fellowship No. 5 FLMH-23, 100-02. It was in part supported by funds from a contract between the University of Rochester and the Office of The Surgeon General (Army), contract number DA-49-193-MD-24.

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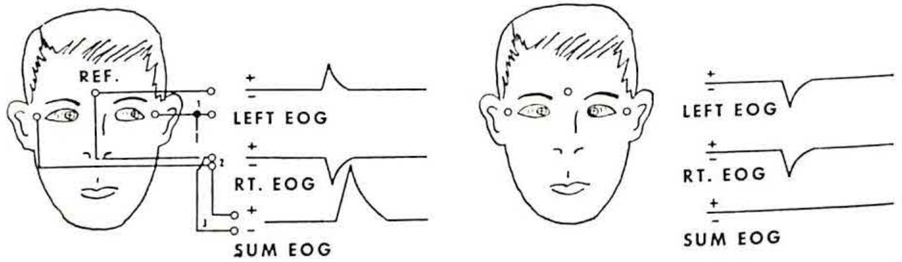
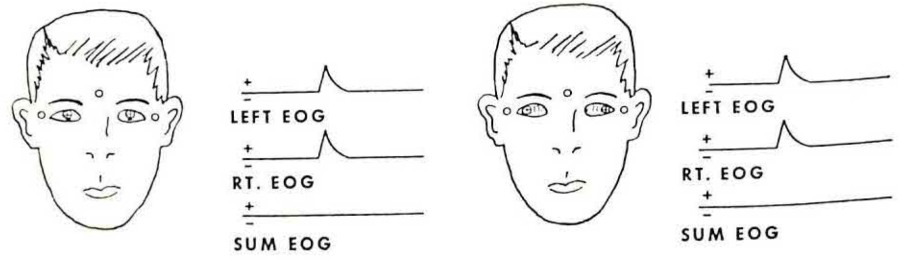
The fact that most amplification systems of ink writing oscillographs offer differential amplification makes it possible to resolve both vertical and horizontal eye movements. Figuratively, a differential amplifier inverts one side of the input, and the output is seen as the difference between any two recording points. As a result, any in-phase signals of the same amplitude and polarity will be rejected (since they will sum to zero). Also, sinusoidal signals, such as 60 cycles, will be rejected. Due to the polarity of the dipole, when the eyes move vertically, the same potential change is reflected between the outer canthi and the reference electrode. This movement cancels on the summated record, but not on the independent records. Since each eye is a separate dipole, conjugate horizontal eye movements lead to a potential that is 180 degrees out of phase with respect to the reference electrode. This causes the recording pens to move in opposite directions with conjugate deviation of the eyes. To facilitate comparison of the records, it is desirable to reverse the polarity of the galvanometer on one of the independent eye channels.



(A) CONJUGATE DEVIATION TO LEFT

(C) DISCONJUGATE DEVIATION INWARD.



(B) CONJUGATE DEVIATION UP.

(D) DISCONJUGATE DEVIATION OUTWARD.

FIGURE 1
RECORDING ELECTRODE CONFIGURATION AND SIMULATED EOG TRACINGS FOR VARIOUS EYE DEVIATIONS

C. Results

The quality of the records can be seen in Figure 2. This record of vestibular nystagmus was taken from a human *S*, on an Offner Type R Dynograph, with eyes closed and in the dark. The *S* was being subjected to horizontal angular oscillation. With the exception of the center portion of the record, it is apparent that the eyes were moving in a conjugate fashion. However, on the second oscillation, the independent eye records show a nonconjugate movement of the eyes. This is probably due to *S*'s blinking, leading to a vertical displacement of the eyes. Since there is a small deflection on the summated record, this would indicate a horizontal component involved with the blink. Thus, analysis of both the independent and summated records permits the experimenter to reconstruct the nature of the eye-movement response.

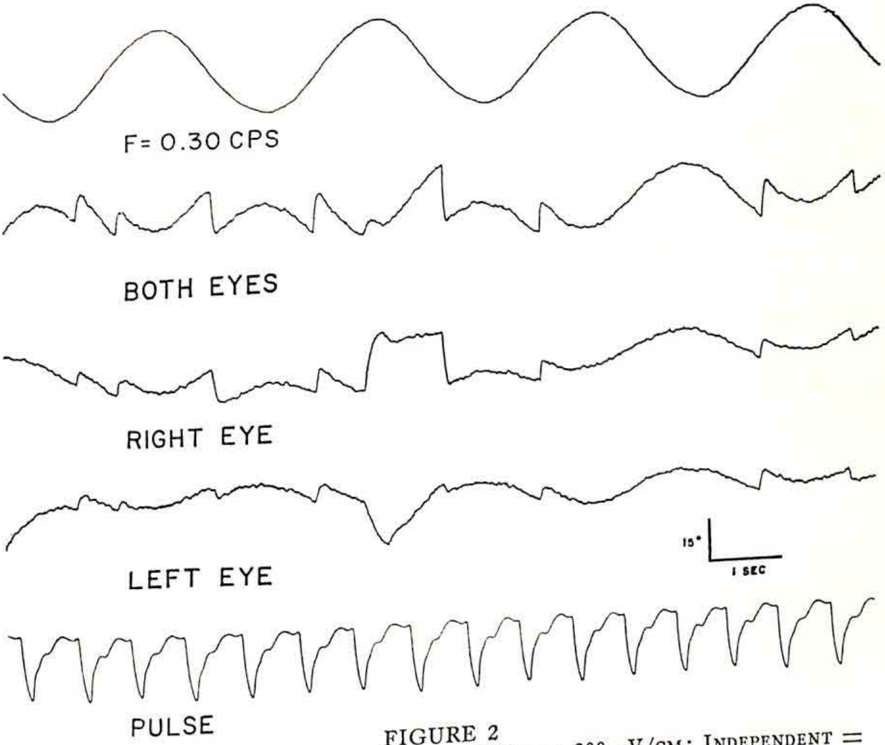


FIGURE 2

Summated and Independent EOG Records (Sum. = 200 μV/cm; Independent = 100 μV/cm, Paper Speed 25 mm/sec.)

There are several other situations in which this combined recording method can be very useful. For example, each eye may be exposed to different stimulus conditions, such as one eye closed, one open, and the effect upon nystagmus measured.

From an efficiency standpoint, this method provides the advantage of being able to obtain three channels of information through only three electrodes. It gives equally good results with cats (electrodes implanted in bone).

There is a major difficulty with this method which must be taken into consideration when evaluating the independent records. Figure 1 shows some of the various eye movements that may be elicited under certain stimulus situations. As can be seen, disconjugate eye movements of equal amplitude will cancel on the summated record, but will appear on the independent records. Therefore, one cannot reliably determine whether the independent records reflect vertical or disconjugate deviations. However, since all movements of this type cancel on the summated record, it is possible to identify horizontal eye movements due to the fact that they will also appear on the summated record. With the use of one additional electrode, above or below the eyes, it is possible to differentiate vertical eye movements from horizontal. Again, one cannot identify disconjugate eye deviations with any certainty. If the research is concerned with disconjugate eye movements, then some other method, such as photographic or photoelectric recording, must be employed before any valid statements can be made.

D. Summary

A method is described for the simultaneous electrical recording of independent and summated eye movements. Problems of interpretation of the records are discussed with relevant examples.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 205-210.

FREE-OPERANT AVOIDANCE OF STIMULI ASSOCIATED WITH HIGH FIXED-RATIO REINFORCEMENT*[1]

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A. Introduction

A previous study (2) demonstrated that the discriminated avoidance of a high fixed-ratio (FR) food reinforcement schedule can be established and maintained concurrently with a variable-interval (VI) schedule of food reinforcement in the pigeon. When the avoidance schedule was converted to a nondiscriminated condition, however, FR-avoidance was not maintained. It was suggested that the chosen parameters of the avoidance schedule may have mitigated against the development of nondiscriminated FR-avoidance. Sidman (5) has observed that animals learn more quickly to avoid shock in a nondiscriminated situation when the shock-shock interval is considerably shorter than the response-shock interval. In the FR-avoidance study, a single timer was employed: *i.e.*, the interval between successively scheduled fixed-ratios (FR-FR) and the interval by which avoidance responses postponed the occurrence of the next fixed-ratio (R-FR) were equal. One purpose of the present investigation was to determine whether nondiscriminated avoidance of a high FR contingency could be established concurrently with VI by varying the duration of the R-FR interval relative to a constant FR-FR interval.

An event may be empirically defined as "aversive" if behavior that prevents it is maintained above operant level (4). In accordance with this criterion of aversiveness, the results of the first FR-avoidance study may be cited as evidence for the notion that high FR schedules possess aversive properties: *i.e.*, the avoidance responding was maintained because it postponed an aversive event—a high FR requirement. Alternatively, the FR-avoidance data may simply indicate that *S*s will learn to respond in such a manner as leads to the most positive reinforcement in the shortest period of time. This latter, relatively parsimonious interpretation is based upon the observation that the average frequency of reinforcement in FR was less than that in VI. A much more

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convincing argument for FR-aversiveness would be the demonstration that *S*s performing under VI will acquire and maintain a response that avoids a stimulus having previously been associated with a high fixed ratio but in which the reinforcement density does not differ from that in VI. A second purpose of the present study was to attempt experimentally to untangle the two opposing interpretations of FR-avoidance.

B. METHOD

1. *Subjects*

The *S*s were three adult, male Silver King pigeons. Two of the birds (SK-14 and SK-3) were experimentally naive at the beginning of the study. The third *S* (SK-13) had had extensive experience on a concurrent discriminated FR avoidance-VI schedule and on a concurrent nondiscriminated FR avoidance-VI schedule as described in detail elsewhere (2). All birds were maintained at 80 per cent of their free-feeding body weights throughout the experiment.

2. *Apparatus*

The experimental chamber was a pigeon box of the type described by Ferster and Skinner (1), modified to contain two response keys mounted 4½ inches apart on one wall.

3. *Procedure*

Bird SK-13 was placed directly on a concurrent nondiscriminated FR avoidance-VI schedule. A FR-avoidance schedule (CRF) was programmed on the left (avoidance) key concurrently with VI on the right (food) key. In VI, reinforcements were made available at irregular intervals of time having a mean interval of two minutes (VI 2-min.). Two recycling timers were used to program the occurrence of FR 500 on the food key. When *S* failed to peck the avoidance key, the time interval between FRs, called the fixed ratio-fixed ratio (FR-FR) interval, was specified by the first timer. The amount of time *S* could postpone FR 500 by pecking the avoidance key is called the response-fixed ratio (R-FR) interval and was programmed by the second timer. A single peck on the avoidance key ended the FR-FR interval and started the R-FR timer. The R-FR interval began anew each time *S* responded on the avoidance key. The FR-FR interval was reinstated after every completion of FR 500. A six-second changeover delay interval (3) was interpolated between a response on the avoidance key and the possibility of reinforcement on the food key as a control for schedule interaction. The avoidance key was transilluminated with yellow light. The food key was transilluminated with white light during VI 2-min. and with green light during FR 500. Sessions terminated after 30 presentations of the reinforcing stimulus (a 3.5-second access to mixed grain). The effects of varying the R-FR interval were compared at R-FR values of 60, 80, 100 and 120 seconds (ascending sequence) with the FR-FR interval held constant at 60 seconds.

The second phase of the experiment was a test for nondiscriminated free-operant avoidance of a stimulus previously associated with a high fixed ratio. Birds SK-14 and SK-3 were shaped by successive approximations to peck the food key on CRF and then trained on VI 2-min. with the avoidance key unlighted and inoperative and the food key transilluminated with white light. Following stability on VI 2-min., a control procedure was initiated in order to determine the operant level of avoidance of a neutral stimulus. The avoidance key was made operative and lighted yellow. The food key color changed from white to green every 60 seconds. When the green key stimulus was presented, the punched tape providing VI reinforcements in the presence of white light was stopped and an independent tape started, providing an identical (VI 2-min.) reinforcement schedule in green. The food key remained green for 60 seconds. A single peck on the avoidance key served to postpone the green key stimulus for 120 seconds. The schedule in effect was a "concurrent nondiscriminated green avoidance-VI" schedule with green-green and response-green intervals of 60 and 120 seconds, respectively. After the initial disruptive effects of the stimulus change had adapted out and an operant level of avoidance responding emerged, the avoidance key was again unlighted and made inoperative and the *S*s were exposed to a multiple schedule consisting of VI 2-min. and FR 500 components in alternation. Variable-interval components of 3-minute duration alternated with FR components until 30 reinforcements were delivered. At the onset of FR 500, the food key changed from white to green. The final manipulation was a test condition in which the *S*s were returned to the concurrent green avoidance-VI schedule.

C. Results and Discussion

Figure 1 shows the development of FR-avoidance for bird SK-13 as a function of the R-FR interval. Data points are taken from the final session at each R-FR value. These results are consistent with shock-avoidance findings (5) and strongly support the contention that the initial failure to obtain nondiscriminated FR-avoidance (2) was due to the employment of equal FR-FR and R-FR intervals.

Figure 2 is a record of avoidance learning for SK-14 and SK-3 where the

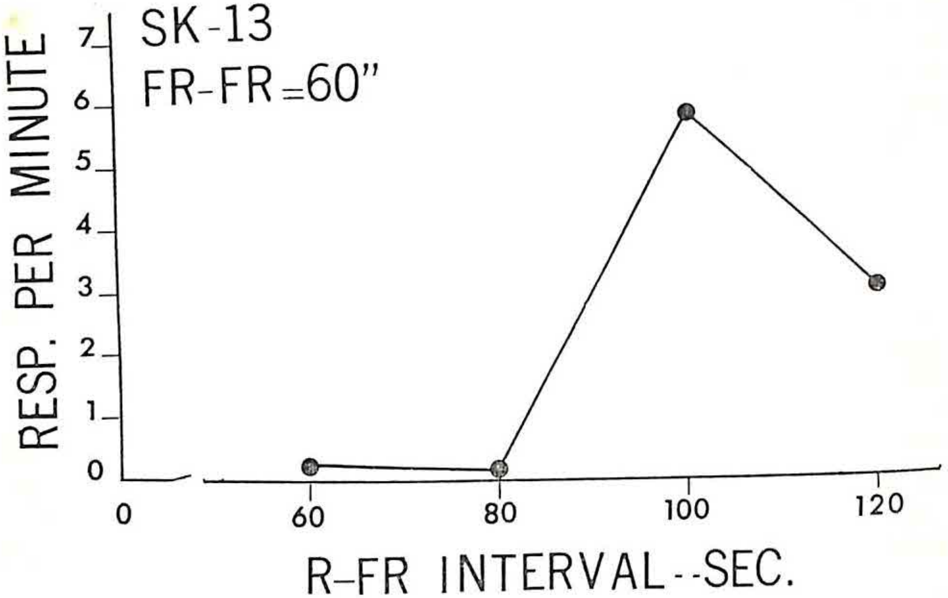

FIGURE 1
AVOIDANCE RESPONSE RATES FOR BIRD SK-13 AT EACH VALUE OF THE RESPONSE-FIXED RATIO INTERVAL

stimulus avoided, a green key color, had previously been a discriminative stimulus for the FR component of a multiple VI 2-min. FR 500 schedule. In the test for avoidance acquisition, primary reinforcement was delivered on independent VI 2-minute schedules in the presence of white and green key stimuli. Since the density of reinforcement was the same in green as in white, green-avoidance responses did not have the added effect of increasing the amount of positive reinforcement *S* received per unit of time as was the case with FR-avoidance, itself. The implication is clear: viz., that a stimulus associated with a high FR contingency may acquire aversive properties. Behavior that prevents the occurrence of this stimulus increases above operant level. Significantly, SK-14 and SK-3 have performed for more than 120 sessions on concurrent nondiscriminated green avoidance-VI with the avoidance response showing no sign of extinction.

D. SUMMARY

Free-operant avoidance of a high fixed-ratio schedule of positive reinforcement was demonstrated for one pigeon in a nondiscriminated avoidance paradigm where avoidance responses maintained a variable-interval reinforcement

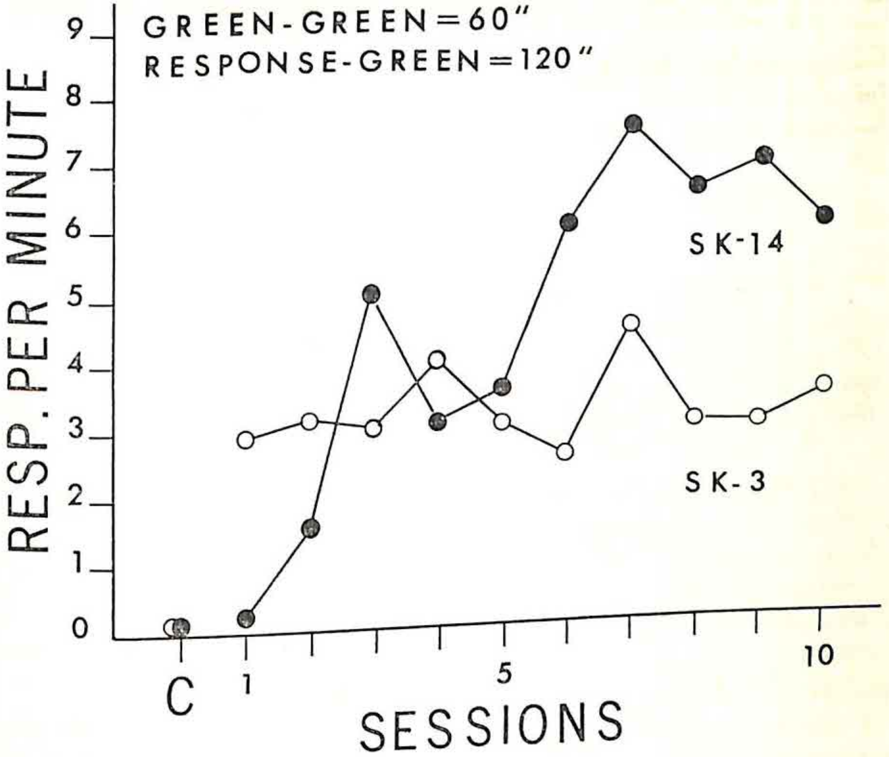

FIGURE 2

Avoidance response rates for two subjects during consecutive sessions of exposure to the green-avoidance schedule following pairing of a green stimulus with the fixed-ratio component of a multiple variable interval-fixed ratio schedule. "C" stands for the final control session prior to pairing the green stimulus with fixed ratio.

schedule in effect. The rate of avoidance responding was a function of the interval by which responses postponed the occurrence of the fixed-ratio contingency. Two additional subjects learned to avoid a stimulus having previously been paired with a high fixed-ratio schedule.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 211-219.

GSR AS A MEASURE OF THE SEXUAL COMPONENT IN HYSTERIA*

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A. INTRODUCTION

Hysteria has been one of the oldest and most controversial mental disorders. Explanations for this form of neurosis varied widely until Freud (8) provided the theoretical framework for today's understanding of the malady. He thought that all hysterical cases were characterized by a psychic conflict over unacceptable (generally sexual) memories and wishes that were not allowed conscious expression by the repressing forces of the ego.

Other psychoanalysts such as Jones (11), Fenichel (7), and Reich (18), supported Freud's hypothesis that the basis for hysterical conflict is sexual, while the primary mechanism of defense is repression. Probably the most common clinical manifestations of hysteria have been conversion reactions and anxiety. When somatic conversions do not occur as an attempted solution of emotional conflict, anxiety hysteria may arise with autonomic accompaniments such as sweating and digital tremor. Although theoretically acceptable, Freud's ideas on mental disorders have been criticized from a number of sources [Hebb (10), Bailey (2), Boss (3)]. Chodoff and Lyons (4) recently challenged Reich's description of the hysterical personality as being obviously sexualized.

This disclaim of psychoanalytic concepts has motivated the experimental testing during the last decade in such areas as repression, dreams, and neurotic anxiety [McGinnies (15), Postman (17), Malmo (16)]. From this type of research, it has become possible to obtain empirical data from hypotheses supported at one time only by theory.

The use of the galvanometer as a measure of human emotion has received growing popularity and support from a number of researchers [Farber (6), Malmo (16), Shagass (19), McGinnies (15)]. Attempts have been made to correlate personality variables diagnosed by such tests as the MMPI and physiological measurement by the GSR (9, 13); and significantly high cor-

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* Received in the Editorial Office, Provincetown, Massachusetts, on July 17, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

relations were found between such symptoms as depression and a low GSR, while anxiety neurosis produced an elevated GSR. Eysenck (5) concluded that hysterics displayed anxiety as a result of the weakened inhibitory potential in the autonomic nervous system.

Laughlin (12) notes that the decrease of expressed somatic symptoms found in urban Western society may be an indicator that the emotional conflict of hysteria has sought deeper and more disguised avenues of discharge. Abse (1) proposes that, while incidences of the more severe conversion symptoms may have disappeared, hysteria can take many forms which elude even today's modern diagnosis. Due to this controversy over the dynamics of hysteria and the lack of reliability in diagnosis, it seems profitable to define the disturbance in physiological as well as behavioral terms.

The general purpose of this experiment was to provide a physiological measure (GSR) of the reaction of the *S*s with elevated scores on the Hysteria Scale (Hy) of the MMPI, to sexual stimuli and a quantification of the amount of repression employed.

Two main hypotheses were advanced: (*a*) the GSRs of *S*s with high scores on the Hy scale in this study would be significantly greater when presented with sexual themes than GSRs of *S*s with normal profiles on the MMPI; (*b*) the group thus termed hysterics would show a significantly greater blocking of verbal recall of sexual themes compared to normal *S*s.

B. Method

1. *Subjects*

From a total pool of over 200 students, 32 white female *S*s were selected by means of the MMPI. The experimental group consisted of 16 *S*s labeled high Hy's (Hy *T* score 65 or above, other scales within normal 30 to 60 range), and the control group was comprised of 16 *S*s termed normal or low Hy (all *T* scores within 30 to 60 range).

2. *Apparatus and Materials*

The galvanometer units of a Keeler Polygraph Model 302c were used as the physiological (GSR) measuring instrument. A tape recorder was used for *S*s' verbal recall.

A semisoundproofed, air-conditioned room was used for the experiment. A false wall separated *S* from the recording equipment. Four passages from fiction and textbooks were reproduced on individual 14 × 10-inch white cardboards. The passages were comprised of two sexual and two neutral themes: e.g., the making of glass and sexual seduction. Three judges rated each passage for its content.

3. *Procedure*

Each of the 32 *S*s was tested individually during the experiment. A female *E* handled all duties involving *S*s, such as attaching the hand electrode and presenting the passages.

During the first phase, the base rate GSR of each *S* was established before the stimuli were presented. *E* then presented each passage individually while *S* silently read the material. Sexual and neutral themes were alternately presented with a 45-second pause allowed to avoid overlapping of the responses to individual passages.

After a time lapse of 24 hours, each *S* returned for the second phase, designed to quantify the degree of repression. *E* again established the base rate GSR, which included some neutral conversation on the part of *S*. *S* was then asked to recall everything she could remember from the previous reading of the four passages. During this time a tape recording was being made.

4. *Response Measures*

GSR results are stated in polygraph chart units due to the type of apparatus employed. Quantification of the GSR units was accomplished by counting the amplitude and distance the pen traveled on the chart for a response to the passage.

Measurement of the amount of repression employed during the second phase was quantified as follows. Typed manuscripts were made from each *S*'s taped verbal recall of the four passages. Three judges determined the units of detail recalled for each passage. Detail consisted of a pertinent fact: e.g., "sand is used to make glass" or "she removed her bra."

C. RESULTS

Mean GSR scores from the first phase of the experiment were subject to a Type I (14) analysis of variance. From Table 1, significant *F* ratios were obtained from the three main variables: Diagnosis (low Hy group *vs.* high

TABLE 1
SUMMARY OF ANALYSIS OF VARIANCE OF GSR FOR BOTH GROUPS WHILE READING PASSAGES

Source	*df*	*M*s	*F*	*p*
Diagnosis	1	87.5	25.7	.01
Error	30	3.4		
Passages	3	67.8	57.5	.01
D × P	3	33.9	28.2	.01
Error	90	1.2		
Total	127			

Hy group, $F = 25.7$; $df = 1$, $p < .01$); Passages (sexual *vs*. neutral, $F = 57.5$, $df = 3$, $p < .01$); and Diagnosis by Passages interaction ($F = 28.2$, $df = 3$, $p < .01$). Since the significant F ratio associated with passages indi-

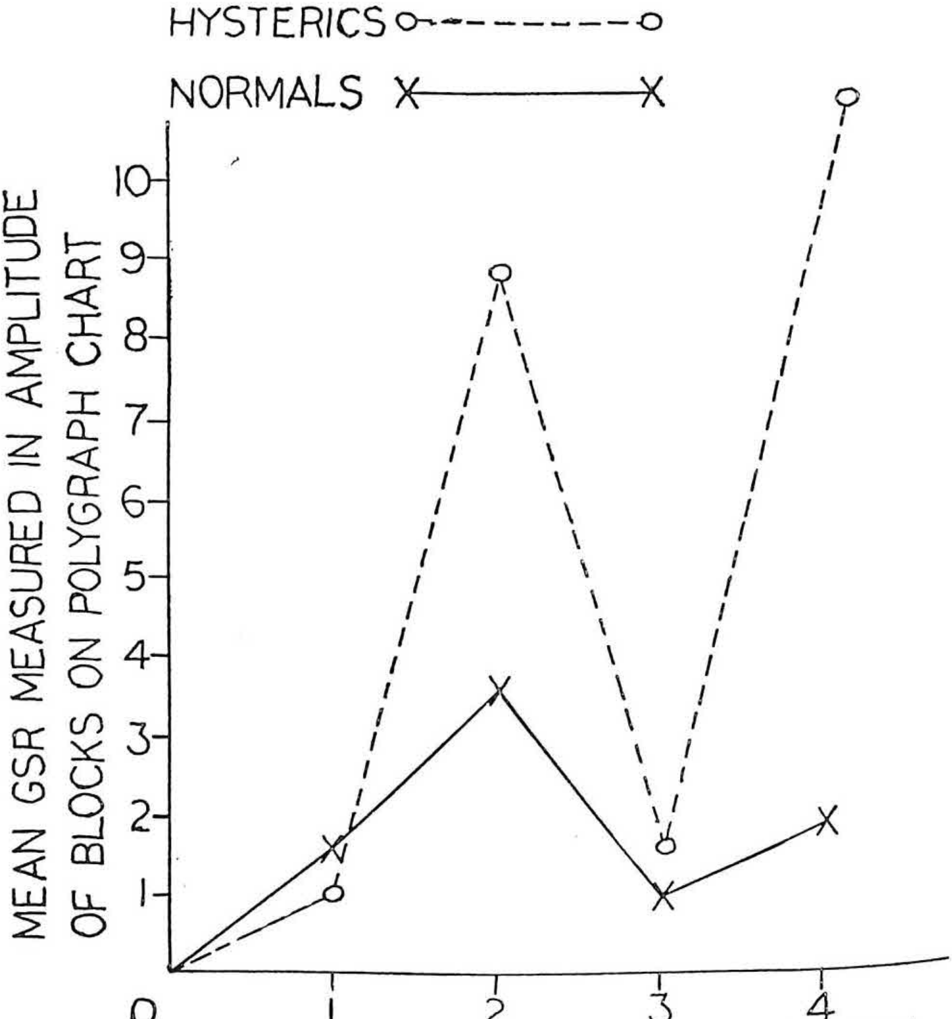

FIGURE 1
DIFFERENCES IN GSR MEASURES BETWEEN HYSTERICS AND NORMALS WHILE READING NEUTRAL AND SEXUAL PASSAGES

cated that one or more of the four means were different, a *t* test was used to determine the nature of the differences. The high Hy group produced a greater mean GSR ($t = 2.4$, $df = 15$, $p < .01$)—not in table—to the second sexual theme as compared to the first. They did not, however, show any difference in GSRs between the two neutral passages. The *S*s in the low Hy group dis-

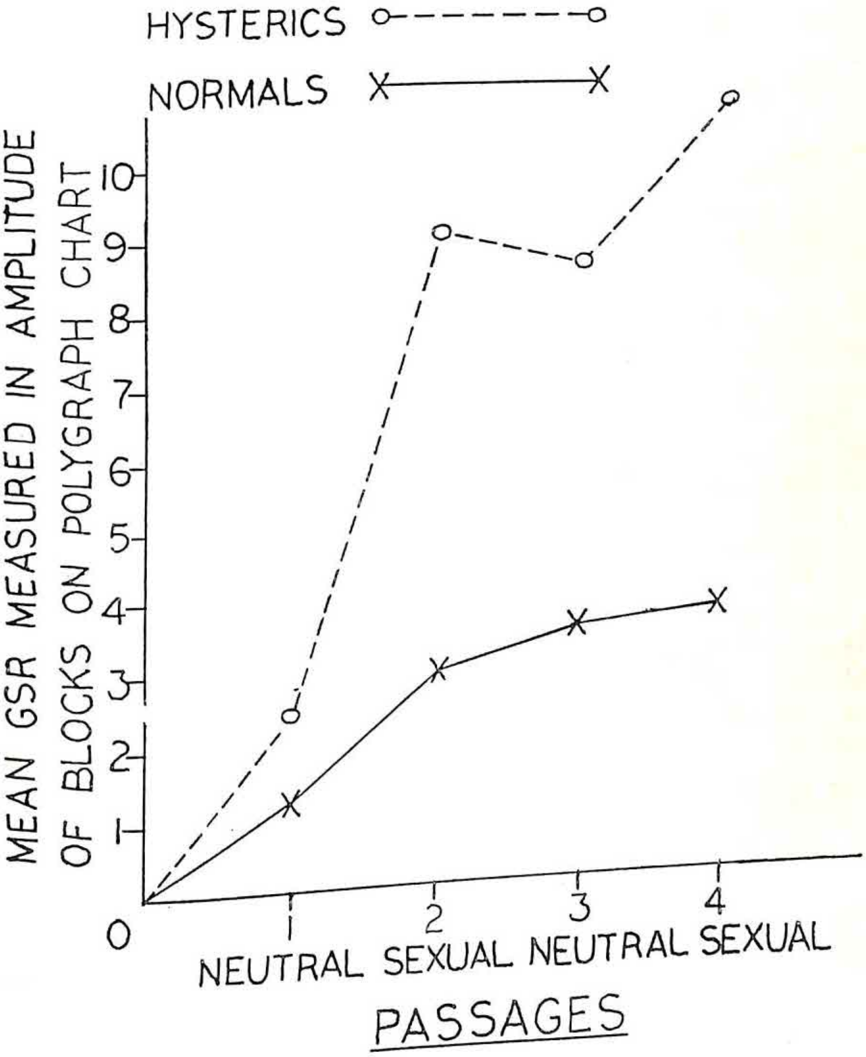

FIGURE 2

Differences in GSR Measures Between Hysterics and Normals While Recalling Details from Neutral and Sexual Passages played no significant difference in GSRs to the individual neutral and sexual themes (see Figure 1).

To determine the more specific results from the classification of either high or low Hy, t tests of the mean GSR differences between the two groups are presented in Table 2. The high Hy group was found to have a significantly greater mean GSR ($t = 4.2$, $df = 30$, $p < .01$) to the combined sexual passages than the *S*s in the low Hy group. No significant differences were found between the two groups' mean GSR to neutral passages.

TABLE 2
t TEST ANALYSIS OF MEAN GSR DIFFERENCES BETWEEN GROUPS WHILE READING PASSAGES

Group	Passages	*df*	*t*	*p*
	Reading sexual passages 1 & 2			
Normals Hysterics	2.51 8.85	30	4.2	.01
	Reading neutral passages 1 & 2			
Normals Hysterics	1.15 1.33	30	.78	N.S.

Mean GSR scores from the verbal recall phase of the experiment were analyzed with a Type I (14) analysis of variance. Once again significant F ratios were obtained for the three main variables: Diagnosis ($F = 7.9$, $df = 1$, $p < .01$); Passages ($F = 93.6$, $df = 3$, $p < .01$); and Diagnosis by Passages ($F = 23.3$, $df = 3$, $p < .01$).

In order to determine the direction of the group differences, the mean GSRs presented in Figure 2 were subjected to a t test. It was found that the high Hy group had a significantly greater GSR ($t = 8.3$, $df = 15$, $p < .01$)—not given in table—while verbally recalling sexual passages than when recalling neutral themes. The low Hy group showed no GSR differences in the recall of sexual and neutral passages.

A chi square test of significance was used to evaluate the units of detail recalled by the two groups. Neutral passages were subjected to a 2 × 2 table using the following categories: *Number of Details Not Recalled* and *Number of Details Recalled*. The results show no significant differences between the two groups. However, low Hy *S*s tended to recall more items from the neutral passages (181, not given in table) than did the high Hy *S*s (157, not given in table).

The units of detail recalled from sexual passages were similarly assigned to a 2 × 3 chi square consisting of the following categories: *Number not Recalled, Nonsexual Detail Recalled* (geographical description beginning each sexual passage), and *Sexual Detail Recalled*. Again, no real differences existed between the two groups, but low Hy *S*s recalled a total of 172 items of sex and nonsex detail combined, while the high Hy group recalled 129 units of detail. A graphic presentation of the two groups' recall from each passage is given in Figure 3.

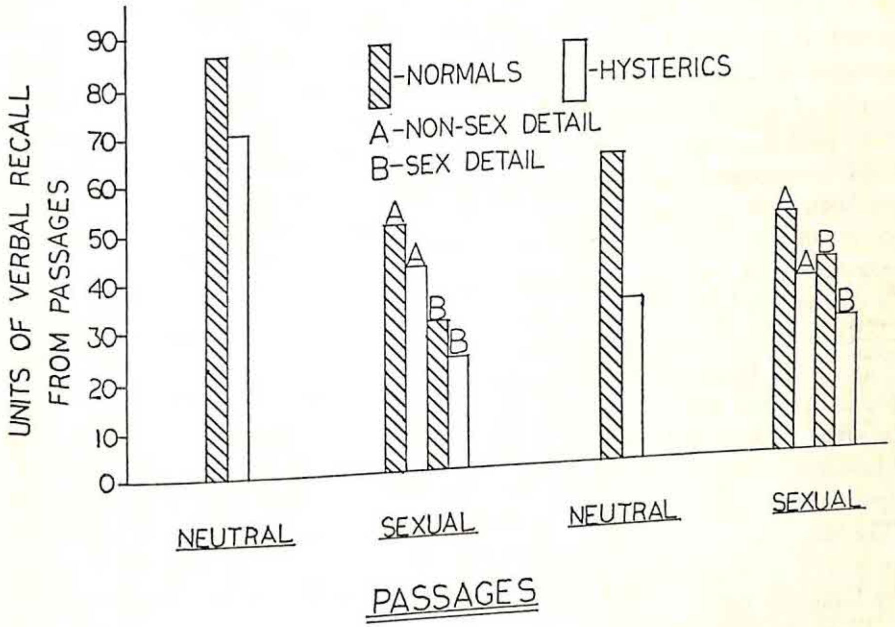

FIGURE 3
DIFFERENCES IN THE AMOUNT OF RECALL BETWEEN HYSTERICS AND NORMALS IN NUMBER OF NEUTRAL AND SEXUAL PASSAGES

D. DISCUSSION

Results strongly supported the first hypothesis which predicted that *S*s with high scores on the Hysteria Scale of the MMPI would produce a greater GSR while reading and later recalling sexual passages when compared with *S*s whose profiles were within normal limits. Normal *S*s evidenced no differential GSR to sexual and neutral themes. The findings generally agree with those of Malmo (16) and Eysenck (5).

The fact that the experimental group (Hy) responded differently on the galvanometer than did the control group suggests several implications. Perhaps the simplest interpretation would be that the MMPI's Hy scale indicates sexual inhibition which can be measured physiologically. Further, if GSR may be taken as a measure of emotion, the experimental group showed a greater emotional response, possibly anxiety or pleasure to sexual stimuli. These data indicate the relevant importance of sexual conflict in hysteria as described by psychoanalytic theory.

The second phase of this experiment was designed to quantify the amount of repression displayed by the two groups. Although not statistically significant by chi square tests, the experimental group consistently recalled fewer details from both the sexual and neutral passages than did the normal group. Here again, more characteristics of hysteria appeared in the experimental group though diagnosed only on the MMPI. According to Freud, hysterics suffer from reminiscences of prior disturbing events and consequently employ some form of repression. In both reading and recall the evidence is consistent with psychoanalytic description. In any event, it seems evident that *S*s with elevated scores on the Hysteria Scale of the MMPI displayed a greater emotional response while reading sexual passages. During the verbal recall phase, such *S*s also recalled, in every case, less total detail from the passages, while their GSRs were significantly greater.

It should be noted that *S*s in the experimental group came from a college population and may be assumed for all practical purposes, to be functioning in other than a debilitated neurotic state. It is quite possible that whatever hysterical conflicts they might have had were handled with fewer signs of severe disturbance than might be found in more classical cases of the disorder. The sharp increase in anxiety and use of tranquilizers by individuals today may be one of the more disguised forms of hysteria that has been suggested by Laughlin (12).

Since these results could reflect a general neurotic personality type even though heightened anxiety and decreased recall of sexual material are suggestive of the classical signs of hysteria, no other categories except "normal" were examined. Before generalizing to physiologically measured differentiations of neurotic groups by GSR, further investigation with the GSR and the MMPI's neurotic scales, as well as with neurotic groups classified by other means is needed.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 221-225.

CORRELATIONAL AND NORMATIVE DATA FOR THE PROGRESSIVE MATRICES WITH RETARDED POPULATIONS*[1]

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A. INTRODUCTION

There have been several correlational studies including the Coloured Progressive Matrices (CPM) and the Wechsler Adult Intelligence Scale (WAIS) for different populations. Most researchers have reported substantial correlations ranging from .50 to .70. McLeod and Rubin (4), in a study of neurotic adults, found correlations between the CPM and WAIS variables from .44 to .78. Hall (2), in another study of adults in a neuropsychiatric setting, obtained correlations between the CPM and WAIS subtests from .28 to .64, with WAIS Verbal .58, with WAIS Performance .71, and with WAIS Full Scale .72. Levinson (3), in a study of normal aged males, presented CPM-WAIS correlations ranging from .34 to .67; and, in general, noted that the correlations decreased as a function of age. Levinson also gave norm-percentiles for Sets A, A_B, B, and the composite A-B for his aged male adults. Other important studies may be found in the references of the above three papers.

The CPM is an attractive instrument for use with vocational rehabilitation (VR) clients; as Hall observes that the CPM ". . . is a potentially useful substitute [for the WAIS] because performance on the test is not affected by motor impairment . . ." (2, p. 23). Moreover, many populations of VR clients, particularly in rehabilitation centers, are educationally or mentally retarded. There is little evidence to support the use of the CPM in addition to other variables and no normative data are available on the CPM for retarded populations. The present study is designed to give correlational and normative information for CPM that may be useful specifically with VR clients and generally with educationally or mentally retarded populations. The correlational portion of the study will indicate the variance overlap between the

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* Accepted by Leonard E. Doob of the Editorial Board, and received in the Editorial Office, Provincetown, Massachusetts, on July 24, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] The authors are indebted to personnel at the Georgia Rehabilitation Center for their assistance in the collection of data.

CPM and other ability and achievement variables, while the normative data may be used directly with individuals in retarded groups.

B. PROCEDURE

1. *Subjects*

The subjects for the study consisted of 107 male and female, white and Negro students at the Georgia Rehabilitation Center (GRC) for whom complete data was available on the CPM, the WAIS, and the Wide Range Achievement Test (WRAT). Another 44 cases were available, also, with CPM scores for normative purposes, so that the total normative sample size was 151. Cases diagnosed as brain damaged were excluded from the study. A previous study (1) indicated no CPM differences in this population with regard to race or sex, but that brain-damaged persons scored significantly lower, particularly in Set A_B.

2. *Testing*

All students were tested during their first week at GRC between June 1964 and June 1966. The WAIS was administered by a VR-approved psychologist. The other tests were given by VR counselors and evaluators. The Word Recognition (WR) and Arithmetic (Arith) tests from the WRAT were used in the study.

C. RESULTS AND DISCUSSION[2]

Correlations, means, and standard deviations of the nine test variables are presented in Table 1 together with age and school grade level of attainment. The CPM means appear very similar to those reported by Levinson (3, p. 290) for the normal aged group, 60 to 64 years. The average grade level of attainment 9.30 is that reported by the student and may be erroneous or, in many cases, a function of "social promotion"; indeed, the average operational achievement level, indicated by the WRAT, ranges from about grade four in AR to grade six for WR. The average *IQ* by the WAIS total is about 86 which, while not legally defined as retarded, certainly places the sample at the lower 10 to 15 per cent of the normal population. The students ranged from 16 to 62 years with a mean of 26.9 years, so that the sample represents a wide age-range for adults.

The correlations among the sets of the CPM are all substantial, ranging from .495 to .619, but not so large as to indicate extreme redundancy in infor-

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[2] The analyses of data were made possible through personnel and facilities of the Computer Center, University of Georgia.

TABLE 1

Correlations, Means, and Standard Deviations of the Nine Test Variables Together with Age and School Grade Level of Attainment ($N = 107$)*

Measure	CPM[a]				WAIS[a]			WRAT[a]		Age	School grade level
	A	A_B	B	TOT	V	P	FS	WR	AR		
CPM[a]											
A		619	495	812	467	503	543	303	248	085	169
A_B			587	873	376	420	441	187	141	111	052
B				842	359	410	425	277	328	136	105
TOT					470	519	549	306	287	135	123
WAIS[a]											
V						622	921	663	582	255	307
P							875	283	306	327	100
FS								547	505	313	239
WRAT[a]											
WR									493	248	353
AR										017	403
Age											012
School grade level											
Means	10.12	9.57	7.26	26.93	88.32	84.66	85.96	71.32	58.31	26.46	9.30
Standard deviation	2.07	2.40	2.59	5.94	13.79	14.20	13.34	31.57	22.41	11.37	13.34

* Decimals omitted from correlations. For 100 degrees of freedom, a correlation of .195 is significant at the .05 level and .254 is significant at the .01 level.

[a] CPM = Coloured Progressive Matrices; WAIS = Wechsler Adult Intelligence Scale; and WRAT = Wide Range Achievement Test.

mation. The correlation between WAIS-V and WAIS-P is .622 and between the achievement variables, WR and Arith, .493.

Similar to findings in other studies, such as Hall (2), the CPM-WAIS correlations are higher with WAIS-P than with WAIS-V, but low enough to support the use of both tests with this population. The variance overlap in CPM and WAIS scores ranges between 11 and 25 per cent. Moreover, in general, the CPM appears to be somewhat more independent from achieve-

TABLE 2
NORMATIVE PERCENTILES FOR SETS A, A_B, B AND TOTAL SCORE OF THE CPM ($N = 151$)

Measure score	Set A	Set A_B	Set B	Total score
36				99.0
35				96.7
34				92.1
33				86.8
32				82.1
31				76.8
30				68.2
29				58.9
28				51.0
27				44.4
26				37.1
25				29.8
24				25.2
23				24.5
22				18.5
21				17.2
20				16.6
19				13.9
18				12.6
17				11.3
16				8.0
15				6.0
14				4.0
13				2.6
12	99	99	99	2.0
11	70.9	80.8	92.7	2.0
10	43.0	50.3	84.8	2.0
9	29.1	34.4	72.2	1.3
8	17.8	23.2	67.5	.7
7	11.9	16.6	57.0	.7
6	6.6	11.9	41.1	.7
5	4.6	7.9	24.5	
4	4.0	6.6	9.9	
3	2.6	3.3	6.0	
2	1.3	1.3	4.0	
1		1.3	2.0	
Means	10.07	9.62	7.38	27.42
Standard deviation	2.18	2.52	2.67	6.52

ment, using WR and Arith as achievement criteria, than is the WAIS. The results suggest that the information provided by scores on the CPM is not duplicated entirely by other information available in the WAIS. In spite of its attractiveness for use with the physically disabled, the CPM will not provide information identical with that available in WAIS-P; but, of course, it will be more similar to WAIS-P than to WAIS-V.

Normative data for the three sets and total score of the CPM are presented in Table 2. The percentiles indicate that Sets A, A_B, and B vary in difficulty for this population, with Set A being least difficult and Set B being the most difficult. All score distributions are skewed negatively, and the Total Score distribution suggests that individual differences may be detected for this population quite readily on this variable.

D. SUMMARY

Available data on 107 and 151 vocational rehabilitation students were used to obtain correlational and normative information, respectively. Information available included CPM, WAIS, and WRAT scores with age and attained school grade level. Low-to-moderate correlations were found between grade level, intelligence, and achievement variables. Substantial correlations were found between the sets of the CPM, between WAIS-V and WAIS-P, and between the achievement variables, WR and Arith. The CPM-WAIS correlations were higher with WAIS-P than with WAIS-V, but the actual proportion variance overlap ranged from .11 to .25. Normative data indicated that Set A of the CPM is least difficult and Set B most difficult. All score distributions were skewed negatively, and the CPM Total Score distribution appeared best for determining individual differences.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 227-234.

AFFECTIVE DIMENSIONS IN CONNOTATIVE MEANING IN READING*

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A. INTRODUCTION

When defining observational learning from real-life or symbolic models, social psychologists and personality theorists generally refer to the process of identification. Within this process, the observer—i.e., the reader, speaker, or writer—tends to think, feel, and perform as though the characteristics of an admired model or hero belonged to him. A high degree of congruence, therefore, is expected in the actions, attitudes, and emotional responses of an observer and a particular model whose attributes the observer favors. Osgood, Suci, and Tannenbaum (17) referred to matching behavior between observer and model, involving a class of responses, as "meaning." Considerable evidence has been consistently reported for a reasonably stable triad of general semantic meanings (3, 4, 15, 16, 17).

When Osgood's measure of the bipolar adjectives, the Semantic Differential (SD), is applied in assessing particular person concepts, more than 50 per cent of the variance of the scaled responses should be attributed to the three general factors of evaluation, potency, and activity. At least three dimensions of connotative meaning, therefore, would be inferred from the factor analysis of the scaled data on adjective pairs.

Affective characteristics in reading performances also have been measured by personality indices. Two personality dimensions that have been related more strongly than other traits to reading variables are anxiety and introversion-extroversion. Most of the research with anxiety measures has assumed a debilitating determinant in general anxiety and concluded that a high level of anxiety is, indeed, blocking toward acceptable reading levels (2, 5, 9, 10, 14, 18, 21). Just as performance on mental ability tests and achievement measures in school are lower under high frustration and anxiety than under ideal conditions, a decrement in reading speed and comprehension scores has been observed when high anxiety is present (1, 11). Little research has focused on the

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* Received in the Editorial Office, Provincetown, Massachusetts, on July 26, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

facilitating effect of anxiety in reading (24, 25, 26). The projections of varied levels of anxiety into the connotative meaning of a story become a testable hypothesis.

In light of the theoretical postulates of introversion-extroversion as viewed by Eysenck (6, 7, 8), Rankin (19) predicted systematic differences on standardized reading tests between introverts and extroverts. Results indicated extroverts made more successive errors on the reading test and had lower mean ($p < .05$) scores on the overall tests than did extroverts. In general, Rankin (19) concluded that reading tests, such as the 1960 revision of the *Cooperative English Test, Reading Comprehension,* were not as valid for extroverts as for introverts.

The purpose of the present study was to examine the predictive relationships of anxiety and introversion-extroversion factors in determining the connotative meaning that a student gives to the protagonist in a select reading passage, as well as the reader's own self-concept.

B. METHOD

1. *Subjects*

The sample comprised 89 (51 females, 38 males) junior and senior students in an undergraduate course in educational psychology.

2. *Procedure*

Each of the students was asked to read a passage entitled, "I Starved For Science" (27). Written in the first person, the account describes the reactions of a man who has volunteered to live on a substandard calorie diet (13). The theme of the story appears to be incapsulated in the following words:

> I was one of 36 men who volunteered to starve for half a year. We did this so that science and the world might understand, first, what happens to a starving person, and second, how much food and how much time it takes to bring him back to normal (27, p. 54).

When each student had read the story, he completed a reading-comprehension test of 20 multiple-choice questions, assessing elements of recognition in the reading passage. Seventeen bipolar adjectives which had maintained relatively high loadings on factors related to person concepts in prior studies (16, 17) were used, and measures of the connotative meaning of the "main character" were obtained from each student. Students' perceptions of the protagonist were rated on a seven-point scale for each of the 17 adjective pairs: e.g., "good-bad," "active-passive," and "strong-weak."

Two weeks following the evaluation of the criterion passage, "I Starved For Science," the study sample was administered the *Sixteen Personality Factor Questionnaire, Form A* (16 PF) and the SD, composed of the same adjective pairs in the initial part of the study, but now rating the concept of "self."

C. Results

Responses on the 17 adjective pairs, assumed to measure the concept of "self," were factor analyzed by means of a principal axes solution. Factors with latent roots greater than one were preserved for rotation (12). Five such factors were extracted, together accounting for 75 per cent of the total test variance. These five factors, then, were rotated to the varimax criterion, and factor scores were determined for all *S*s from the rotated factor structure.

TABLE 1
Factor Structure of Responses on the 17 SD Scales Relating to Self*

	Factors					
Adjective pairs	I	II	III	IV	V	h^2
good-bad	.74					.66
pleasant-unpleasant	.78					.67
happy-sad	.68					.54
fair-unfair	.73					.57
large-small		.80				.53
strong-weak		.67				.62
heavy-light		.94				.48
thick-thin		.92				.68
smooth-rough		.53		.59		.67
fast-slow			.66			.62
active-passive			.75			.89
hot-cold			.48			.86
sharp-dull			.75			.57
fresh-stale		.52	.58			.72
angular-rounded				.67		.45
tense-relaxed				.57		.87
dry-wet						.60

* All loadings below .48 were omitted.

Table 1 presents the major rotated factor loadings for the factor structure of the variables rating the concept "self."

The first factor contributed 25 per cent to the total factor variance with four adjective pairs. Since all four pairs referred to "values" or the "worthiness" in the concept of self, Factor I was labelled Evaluation. Factor II had five bipolar adjectives having a common meaning of "power or ability," and, therefore, was called Potency. Since all of the five variables in the third factor were related to "action or movement," Factor III was named Activity. The connotation of the doublet in Factor IV seemed to be Anxiety. Factor V was not observed to be a common factor at all, but specifically is determined by the adjectives "dry-wet." From previous research by Osgood *et al.* (16, 17), the correlational structure of the 17 SD items was expected to contain three general factors: evaluation, activity, and potency. In the present study, the same common factors were verified in responses relating to "self" forming a basic structure of four common factors with the anxiety dimension.

When examination is made of the factor structure of the students' responses rating the protagonist, it appears that six semantic factors emerge from the analysis: four common factors and two singlets (Table 2). Factor I, containing substantial loadings in variables connoting value and worth of stimuli, contributed 24 per cent of the cumulative variance. The generality of meaning across the six adjective pairs suggested the label Evaluation. Factor II is the semantic factor of Potency, while Factor III represents the Activity factor. The first three factors, therefore, appear to have stable correspondence with Osgood's traditional factors (16, 17). The remaining common factor reflected an active-neurotic dimension and was called Anxiety.

A factor analysis also was obtained from the raw scores of the students' responses to the 16 PF. Five independent factors were obtained, two of which contributed 52 per cent of the cumulative factor variance: i.e., Anxiety and Introversion-Extroversion. Based on Factor scores for Anxiety and Introver-

TABLE 2
FACTOR STRUCTURE OF RESPONSES ON THE 17 SD SCALES RELATING TO THE PROTAGONIST*

Adjective pairs	Factors I	II	III	IV	V	VI	h²
good-bad	.71						.61
pleasant-unpleasant	.67						.69
happy-sad	.67						.66
fair-unfair	.52						.63
large-small		.88					.77
strong-weak		.51					.68
heavy-light		.89					.83
thick-thin		.88					.73
smooth-rough					.83		.71
fast-slow				.63			.69
active-passive			.83				.81
hot-cold						.86	.51
sharp-dull	.56						.48
fresh-stale	.57						.82
angular-rounded		—.55					.84
tense-relaxed				—.69			.54
dry-wet			—.68				.71

* All loadings below .50 were omitted.

sion-Extroversion, two groups were identified. The upper 33 per cent of each distribution of factor scores was called Group 1, while the lower 33 per cent of the distribution was labelled Group 2. Pearson product-moment correlations were obtained between the Anxiety and Introversion-Extroversion factors with each of the semantic factors related to "self" and to the "protagonist."

A stepwise regression was obtained between personality and semantic factors. Results showed that, among the relatively high anxious students, predictions of the general semantic meaning of the protagonist could be made from measures of personality behavior: Evaluation-Independence ($r = .47$, $p < .01$); Activity-Anxiety ($r = .42$, $p < .05$); and Anxiety-Anxiety ($r = .38$, $p < .05$). The self-concepts of the readers were also predicted from personality factors—viz., Evaluation-Anxiety ($r = .41$, $p < .05$) and Potency-Anxiety ($r = -.38$, $p < .05$)—as well as from protagonist factors: Anxiety-Potency ($r = -.38$, $p < .05$); Potency-Tangibility ($r = -.38$, $p < .05$), and the specific factor, "Dry-Wet"-Tangibility ($r = -.54$, $p < .01$).

Among students rated relatively low in general anxiety, only the readers' self-concept factors were predictable from personality factors: Potency-Independence ($r = -.37$, $p < .05$), Anxiety-Introversion-Extroversion ($r = -.46$, $p < .01$), and Anxiety-Independence ($r = -.40$, $p < .05$). The general Evaluation factor in the readers' rating of "self" also was significantly related to the readers' rating of activity in the protagonist ($r = .38$, $p < .05$).

Students with relatively high factor scores on Extroversion projected Tangibility from the personality factor of Anxiety ($r = .38$, $p < .05$) into the assessment of the protagonist, as well as activity into their own self-concept measure from the personality factor of Independence ($r = .45$, $p < .01$). When introverted students rated their own self-concepts on the common factor of Evaluation, it was observed that this rating was significantly related to their own personality characteristic of Anxiety ($r = .49$, $p < .01$). The "Dry-Wet" factor in their own self-concept measure was markedly predicted from Anxiety ($r = -.37$, $p < .05$) and Introversion-Extroversion ($r = -.51$, $p < .01$) traits in their personality behavior.

D. DISCUSSION

From the responses of students on the SD, connotative meaning of person concepts appeared to be reduced to the three general semantic factors cited by Osgood *et al.* (15, 16, 17): namely, evaluation, potency, and activity. Further support, therefore, is given to the SD methods of measuring the affective components in meaning of person-centered concepts.

In general, the readers' personality behavior and self-concept variables shared a high degree of communality in predicting affective measures in a select reading passage. This finding supports conclusions reported by Rentz and White (20) that the SD ratings of self are highly congruent with the "self as process" variables in the 16 PF.

The relatively high anxious undergraduate reader appeared to project into the protagonist ratings affective characteristics of the reader, himself. The low anxious reader, however, was not as predictable from the same indices. It should be noted that those college students who are relatively high on anxiety measures of the 16 PF should not be looked upon as having levels of anxiety that were indicative of psychoneurosis. It might be better to characterize this group of students as tense, highly achieving, and highly emotional, but not imbalanced or in need of psychotherapy. The perception of the value and worth (Evaluation) of the protagonist, as well as the affective meaning of activity (Activity) and anxiety, were dependent upon the personality behavior of the reader. Even the reader's own self-concept was highly related to personality behavior and perception of the protagonist.

Those college students in the sample who were rated low in anxiety did not seem to relate their own patterns of behavior to that of the protagonist. The highly intelligent, strong-ego type of student with relatively low ergic tension meets stressful stimuli and interacts adequately with his environment. Such a student may not have identified with the main character of the story. Other students with relatively low anxiety may be merely demonstrating "cheap economy" by refusing to expend the energy to be concerned over academic tasks, school assignments, reading, etc. Why these low anxious students did not identify with the protagonist in any measurable way is a matter of conjecture and future research. Discriminable connotative meaning of the main character could not be significantly related to the personality and self-concept of the low anxious reader.

Relatively high factor scores on Extroversion-Introversion indicated the outgoing, expressive, social behavior of the students. Apparently, the college readers felt some identity with the protagonist via the general meaning in the connotation of the "rough-smooth" dimension called Tangibility. If these students felt that the protagonist was a rather rugged, rough sort of an individual, such a feeling would be highly related to the general anxiety that the students perceived in themselves.

Introverted students perceived anxiety in the protagonist's rating which was highly related to the characteristic of Independence they found in themselves. The two second-order factors of Anxiety and Introversion-Extroversion were significant predictors of the self-concept measures of college readers who were more withdrawn, shy, and retiring.

The major suggestion from this study points to the theory that, as readers approach the meaning of behavior, of symbols, models, or main characters in a story, their interpretation is highly related to their own personality and self-concept variables.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 235-239.

SELF-ACCEPTANCE: SOME ANXIETY AND COGNITIVE STYLE RELATIONSHIPS*

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A. INTRODUCTION

A number of studies support the assertion that anxiety is inversely related to self-acceptance. Lipsett (9) found that Children's Manifest Anxiety Scale (CMAS) scores were positively related with the tendency toward self-disparagement. CMAS scores have been found to load highly on a factor defined by measures of dissatisfaction with self, social inadequacy, and lack of personal adjustment (11). With older *S*s, Winkler and Myers (14) obtained a correlation of —.71 between scores on the Taylor Manifest Anxiety Scale (TMAS) and the self-acceptance score on the Bills Index of Adjustment and Values, IAV (2). In a methodologically inventive study (7), the TMAS was significantly related to a generalized distance measure employed to index the congruency of perceived-self and self-as-mother with *S*s who were pregnant.

The studies cited here share the assumption that anxiety is a unidimensional construct. A study by Jackson and Bloomberg (8) and the work of Cattell (3, 4, 5) indicate that anxiety is a multidimensional construct. The assumption of unidimensionality leads to the summing of item responses to arrive at a score representing anxiety. It is thereby assumed that the items entering into the sum are comparable to each other in their psychological meaning. Where items or subsets of items embedded in an instrument are relatively unrelated, a score based on an additive model can be arrived at in a variety of psychologically different ways. Interestingly enough, the TMAS was demonstrated to be multidimensional more than 10 years ago (10).

The present study adopts the position of Cattell in conceptualizing anxiety as a second order factor which subsumes a number of primary factors that make a contribution to the construct of anxiety. It then becomes a question of whether the primary factors contributing to anxiety are all predictably related to self-acceptance or whether certain primaries contribute to a given relationship and others do not. The major purpose of the study described here was to

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* Received in the Editorial Office, Provincetown, Massachusetts, on July 26, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

determine whether dimensions subsumed by the construct of anxiety all made a contribution to the relationship of anxiety with self-acceptance.

In addition to the foregoing, the study sought to explore the relationship of several cognitive style measures with self-acceptance. These included dogmatism (12), field independence (15), and preference for complexity (1). The Barron Preference for Complexity Scale (BCS) purportedly measures at least one aspect of creativity, whereas both dogmatism and field independence have been invoked by some theorists in efforts to conceptualize factors predisposing to the creative act.

B. METHOD

*S*s consisted of 125 freshmen entering the College of Education at the University of Maine. The group was administered the 16 Personality Factor Questionnaire, Bills IAV, Dogmatism Scale (D), BCS, and a group embedded-figures test (EFT) measure of field independence. The IAV provides a measure of self-acceptance. Subsequently *S*s whose scores on this scale were at least .5 standard deviation above the mean were classified as a low self-acceptance group. This procedure resulted in a high self-acceptance group consisting of 33 *S*s and a low self-acceptance group consisting of 35 *S*s.

The mean profiles on the 16 PF, EFT, BCS, and D were then subjected to a multivariate analysis of variance to assess whether the groups differed with respect to overall personality profile. This analysis resulted, as expected, in a significant *F* ratio. Univariate *t* tests were then calculated to determine which means were most significant on an individual basis. Procedures described by Cooley and Lohnes (6) were employed for the multivariate analysis of variance.

C. FINDINGS

Table 1 summarizes the results of the multivariate analysis of variance.

Results summarized in Table 1 with respect to H1 lead to a failure to reject the hypothesis of no difference in groups dispersions which is a precondition of the multivariate analysis comparing group mean vectors. The *F* re-

TABLE 1
HIGH VS. LOW SELF-ACCEPTANCE: TESTS OF EQUALITY OF GROUP DISPERSIONS AND OF THE EQUALITY OF MEAN VECTORS

Hypothesis	*F* ratio	Probability
H1 = M = 320,61	$F = \overset{190}{13242} = 1.16$	$p = > .05$
H2 = A = 0.550	$F = \overset{19}{48} = 2.07$	$p = < .05$

ported for the test of H2 ($F = 2.07$; $df = 19, 48$; $p < .05$) supports the general notion of a difference between self-acceptors and *S*s relatively low in self-acceptance when their personality profiles are compared. Univariate descriptive statistics and associated *t* tests are presented in Table 2 and assist in clarifying what scales make a contribution to the distinction implied by the multivariate analysis.

TABLE 2
TOTAL GROUP MEANS AND STANDARD DEVIATIONS FOR SELF-ACCEPTANCE STUDY ASSOCIATED *t* TESTS

	Low acceptance		High acceptance		
	$\bar{X}$	*S*	$\bar{X}$	*S*	
Examination	$N = 35$		$N = 33$		*t*
16 Personality Factor					
A	1. 11.23	2.76	12.45	3.57	—1.59
B	2. 9.06	1.63	8.58	2.00	1.09
C	3. 12.71	3.11	15.93	3.14	—4.25**
E	4. 11.45	5.31	11.51	4.06	0.05
F	5. 15.97	4.40	16.09	4.96	0.11
G	6. 10.94	3.24	14.39	3.47	4.24
H	7. 8.97	5.26	12.21	4.26	—2.78**
I	8. 11.46	2.86	10.72	3.23	0.99
L	9. 9.91	3.12	8.48	2.90	1.96
M	10. 11.97	2.90	11.09	3.29	1.17
N	11. 9.94	2.59	10.60	2.30	1.11
O	12. 12.54	3.73	10.94	2.54	+2.06*
Q1	13. 9.17	2.60	9.39	2.60	0.35
Q2	14. 10.91	3.15	9.94	3.22	1.26
Q3	15. 8.14	2.84	10.55	3.18	—3.29**
Q4	16. 14.77	4.44	11.70	4.52	+2.83**
EFT	5.57	3.75	6.42	3.78	—0.93
BCS	20.97	4.59	17.88	3.13	3.29**
DS	151.91	25.52	149.48	19.92	.435

* $p < .05$.
** $p < .01$.

Inspection of Table 2 discloses that the means of the high and low self-acceptance groups are significantly different for seven of the 16 scales of the 16 PF. Furthermore, six of the seven significant differences are on the scales making a contribution to the second order factor of anxiety. More specifically the low self-acceptant group manifested tendencies towards ego weakness (C—), shyness (H—), paranoid tendency (L+), guilt proneness (O+), low integration (Q3—), and high ergic tension (Q4+). Thus, at least insofar as the 16PF measures the dimensions underlying anxiety, they all serve in delineating self-acceptance. When second order factor scores representing anxiety were correlated with the IAV self-acceptance score for the total sample an r of —.46 ($p < .01$) was obtained. In addition, a tendency toward weaker superego strength (G—) serves to describe the low acceptance group. The only other scale yielding a significant *t* ratio is the BCS with the low self-acceptance group obtaining the higher mean. This indicates that low self-acceptance *S*s tended to have higher preference for complexity and, therefore, may be somewhat more creative or at least are more likely to be creative.

D. Discussion

The present study is in essential agreement with the findings of Smith (13) who observed significant correlations of 16PF scales representing ego weakness, guilt proneness, low integration, and high ergic tension with measures of self-concept discrepancy he designed to assess self-acceptance. The major problem in Smith's investigation was that a number of statements he employed in assessing self-concept were designed to tap areas of personality functioning patterned after the 16PF itself, thus introducing spurious overlap. Perhaps more importantly, the present study supports the position that a variety of source traits which make a contribution to the general anxiety syndrome all make a contribution in delineating relative degree of self-acceptance.

It is noteworthy that neither the D scale nor the EFT yielded significant differences. The work of Witkin (15) suggests that field independent *S*s might be expected to be more self-acceptant as compared with field dependent *S*s. Perhaps the use of a group form of the EFT mitigated against detecting such differences. No such *ex-post facto* reasoning can be invoked to explain the failure of the D scale to demonstrate a significant difference. Rokeach (12) clearly theorizes that closed minded *S*s would be expected to manifest feelings of self-inadequacy and self-hate.

The BCS produced the only significant difference other than those observed for scales of the 16PF. Interestingly enough, the low self-acceptance group had the higher mean. This might be interpreted as indicating that the creative individual is less self-acceptant than his less creative peers. Put in another way, the creative person might be construed as being in a state of conflict with respect to acceptance of self and this dissatisfaction may serve as a source of stimulation to the creative act. On the other hand, the creative *S* may simply be more open to inner dissatisfaction and willing to admit inadequacies due to a less defensive attitude in the test-taking situation. Since the BCS, as here employed, is treated as a unidimensional construct, the foregoing are *post hoc* speculations based upon the assumption that the BCS taps an important aspect of the creative personality.

At any rate, despite the criticisms of self-concept measures, such as the IAV (16), the bulk of the evidence serves to support the construct validity of the

IAV self-acceptance score. The anxiety relevant scales of the 16PF all produced differences of a statistically significant nature in the expected direction.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 241-243.

BIRTH ORDER AND PPS AFFILIATION*

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A. INTRODUCTION

Since Schachter's book (6), a number of studies have reported birth order effects in a variety of situations. The hypothesis underlying much of this work is that certain family relationships give rise to higher affiliative needs for first borns and only children than for other children. One approach has been to compare the affiliative imagery produced in response to selected Thematic Apperception Test (TAT) cards by groups differing in ordinal position of birth. Conners (1) found that only children had higher need affiliation scores than either first or second borns. First and second borns did not differ significantly. First born women scored higher on need affiliation than later born women in a study by Dember (2), but the results for men were not significant. Sampson (5) found higher need affiliation scores for first born than later born groups of both sexes. Staples and Walters (7) reported essentially the same result, but details concerning the sample were not given. Although not entirely consistent and based on relatively small samples, these studies using TAT responses all show some relationship between need affiliation and birth order. The interest of the present study was to compare groups differentiated by birth order and family size on need affiliation scores as measured by a nonprojective instrument, the Personal Preference Schedule (PPS).

B. METHOD

The PPS and a biographical information form containing items about birth order and number of siblings were administered to eight introductory psychology sections. Since a sex difference has been reported on the Affiliation scale of the PPS (4), the total sample was divided by sex. Within each sex the following six groups were identified (numbers in parentheses refer to the number of males and females respectively): I—Only child (20, 24); II—Older of two children (52, 68); III—Younger of two children (50, 64); IV—Oldest of three or more children (50, 64); V—Intermediate among three

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* Received in the Editorial Office, Provincetown, Massachusetts, on August 7, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

or more children (22, 34); and VI—Youngest of three or more children (68, 81). With these groups, a 2 × 6 factorial analysis of variance was performed on the Affiliation scale scores.

C. Results

A summary of the analysis of variance is given in Table 1. Only the sex main effect was significant ($F = 39.61$, $df = 1{,}552$; $p < .01$). This result is consistent with the normative data reported by Edwards (3). Since neither the sex nor age of nearest sibling had been taken into account in the grouping, the four two-children groups were broken down by sex of other sibling (same-opposite) and age difference between siblings (three or less-more than three years). A separate 2 × 2 factorial analysis of variance was performed within each group. None of the resulting *F*s was significant at $p \leqq .05$, indicating that for these groups sex of sibling and age difference between siblings do not alter the results of the primary analysis.

TABLE 1
Summary of Analysis of Variance

Source	*SS*	*df*	*MS*	*F*
Sex (S)	755.81	1	755.81	39.61*
Birth Order (B)	136.00	5	27.20	1.42
S × B	90.51	5	18.10	<1
*S*s within groups	10,533.64	552	19.08	

* $p < .01$.

D. Discussion

For the college sample used in this study, birth order was not related to PPS affiliation scale scores. A consideration of sibling sex and age did not alter this general conclusion.

The difference in the results of this study and those using TAT based measures presents at least three alternatives. First, for some reason the need was not aroused in the present study but was aroused in the previous studies. This possibility seems rather unlikely, since the use of college students in a relatively stress-free situation was common to this study and the previous studies. A second alternative is that the projective procedure provided a more sensitive measure of the need than other procedures. No very satisfactory means of evaluating this alternative seems evident. However, an attempt to heighten arousal by experimentally induced anxiety during the PPS administration could be tried. A third possibility is that the PPS Affiliation scale and imagery to selected TAT cards do not measure the same aspects of an "affiliative need." The authors could find no information on the relationship between these two measures. However, on the basis of the lack of relationship between the PPS achievement scale and need achievement score derived from responses to TAT (or similar) cards (1), it would not be surprising to find relatively little relationship between affiliation measures from the two procedures. It is suggested that the projective and PPS measures do tap at least different aspects of the "need" and that whatever is tapped by the PPS Affiliation scale is not related to birth order in a college sample.

E. SUMMARY

In order to investigate the relationship between birth order and a nonprojective instrument purporting to measure need affiliation, the PPS was administered to 564 introductory psychology students. Six groups were identified on the basis of sex and birth order. An analysis of variance performed on the Affiliation scale scores indicated a significant difference between sex means, but not significant variation among the means of the birth order groups. It was concluded that, whatever aspect of an "affiliative need" was measured by the PPS, it was unrelated to birth order.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 245-247.

PREFERENCES ON THE PERCEPTUAL REACTION TEST AS A FUNCTION OF SEX, SCHOOL GRADE, AND RACE*[1]

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A. INTRODUCTION

There have been numerous studies that demonstrate that different populations, distinguished by crime record (7), psychological disturbance (6), presence or absence of physical illness (3), age (5), etc., have different preferences on the Perceptual Reaction Test (PRT). The PRT consists of a series of 60 abstract designs (2). A resume of the theoretical framework and research on the PRT may be found in Berg, 1967 (4), and in Adams and Butler, 1967 (1). The present study was undertaken to determine whether or not different preferences develop as a function of sex, school grade, and race. In addition to the empirical data of Hesterly (5) on age and sex differences, there seemed to be reasonable grounds for expecting racial differences. Although whites and Negroes share the same geographic region and many other environmental conditions in common, it appears that their experiences are markedly different. The differences in experiential background were expected to be reflected in different preferences for abstract designs.

B. METHOD

Children enrolled in the Louisiana public schools of East Baton Rouge Parish during the period from 1963 to 1965 were administered the Perceptual Reaction Test. The subjects were instructed to indicate how much they liked or disliked each design by marking one of the following alternatives: like much, like slightly, dislike slightly, and dislike much. A fifth alternative of making no response to a design was included in the analysis of the data. The test was not timed and the students were informed that there were no right or wrong answers. The three variables—sex, school grade (4th, 8th, and 12th), and race (white and Negro)—were combined in a factorial arrangement. There were 50 children in each of the 12 conditions, and 600 children altogether (300 males and 300 females). Staff members of the Baton Rouge school system stated that all of the schools involved were attended primarily by children of low socioeconomic status. Children who were not of the age appropriate to the grade in which they were enrolled were excluded from the study.

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* Received in the Editorial Office, Provincetown, Massachusetts, on August 9, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This research was supported by a grant from the Louisiana State University Foundation and by NSF Grant No. GP-2812 to the Computer Center. The assistance of the staff and children of the East Baton Rouge school system is gratefully acknowledged. The authors also wish to thank Elaine L. Douglas and Edward Weigand for valuable clerical assistance.

C. Results and Discussion

Comparisons between selected treatment conditions are listed in Table 1.

Since there were five options for each of 60 items, there were 300 possible comparisons. One might anticipate that by chance, at the 5 per cent level of significance, approximately 15 of the 300 comparisons would show group differences. Although some differences in preferences for PRT figures were found between sexes, as shown in Table 1, the number of items marked differently is so few that, for all practical purposes, it may properly be said that male and female Negro children do not differ in their responses on the PRT. This finding is consistent with data obtained by Spruill (7) for white male and female children. It should be noted that Hesterly (5) compared children's responses on the PRT to adults' responses. Since it is known that adult males and females do differ in their responses to the PRT, Hesterly developed separate scales for male and female children, providing thereby a basis for children-adult response comparisons.

TABLE 1
Selected Sex, School Grade, and Racial Comparisons on the Perceptual Reaction Test

Variables	Comparisons	Items marked differently*
Sex	4th Grade Negro Male *vs.* 4th Grade Negro Female	6
	8th Grade Negro Male *vs.* 8th Grade Negro Female	11
	12th Grade Negro Male *vs.* 12th Grade Negro Female	6
Age	4th Grade Negro *vs.* 8th Grade Negro	69
	4th Grade Negro *vs.* 12th Grade Negro	115
	8th Grade Negro *vs.* 12th Grade Negro	18
Race	4th Grade White Male *vs.* 4th Grade Negro Male	26
	12th Grade White Male *vs.* 12th Grade Negro Male	20
	4th Grade White Female *vs.* 4th Grade Negro Female	17
	12th Grade White Female *vs.* 12th Grade Negro Female	17

* $X^2 = .05$.

Comparisons made between white and Negro children similarly showed few items significantly different beyond the chance level. It may be said, for all practical purposes, that white and Negro children do not differ in their response preferences on the PRT.

The results of the present study showed reliable age differences among children. This is consistent with studies of white children (5, 6, 7). The age difference was least apparent in the comparison between 8th and 12th grade children. Perhaps Negro children's preferences for abstract designs do not change much during early adolescence.

The results of this study suggest that the PRT is generally sensitive to age differences, but that it is sensitive in only a minor way to cultural differences associated with sex or race.

D. SUMMARY

Children's preferences for the designs of the Perceptual Reaction Test were compared on three variables: sex, school grade, and race. Preferences varied according to school grade, but preferences between white and Negro children and between sexes varied to only a minor extent.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 249-256.

SEX DIFFERENCES IN THE PERCEPTION OF ACADEMIC ACHIEVEMENT AMONG ELEMENTARY SCHOOL CHILDREN*

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A. INTRODUCTION

Sex differences in specific areas of academic achievement have been reported from the first grade to graduate school (3, 4). Girls, initially and up to the fourth grade, outperform boys in all subjects, but by junior high school boys establish their superiority in mathematics and science. The poor academic performance of boys in the early grades is ascribed by Kagan (1) to an initial perception of school as excessively feminine at a time when boys are striving to develop a masculine sex-role identification. During adolescence, academic proficiency becomes linked to vocational success among boys, whereas during the same period a reverse process occurs among girls and their transition through adolescence is accompanied by decreasing motivation toward academic mastery.

Despite this developmental shift in achievement, girls nevertheless, even at the college level, do make better overall school records than do boys. Tyler (4) suggests that the docility and submissiveness which enable girls to make a more favorable impression on teachers inevitably shows up on report cards in places other than the deportment columns. Wylie (5) reasoned that even in the absence of inferior grades junior high school girls, through a process of generalization, may come to the idea of their intellectual inferiority. She hypothesized that girls' self-estimates of ability to do schoolwork would be more modest than the self-estimates of boys. Contrary to prediction, a strong self-favorability bias was found among both boys and girls. Indeed, 75 per cent of Wylie's 823 subjects perceived themselves as standing in the "top half" of their homerooms in their ability to do schoolwork. The mean *IQ* of the peers perceived by these students as being "most nearly equal" to themselves academically was significantly higher than their own.

It was hypothesized that the middle grades of the elementary school are a transitional period during which boys close the academic gap between them-

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* Received in the Editorial Office, Provincetown, Massachusetts, on August 15, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

selves and girls and the period during which girls learn to believe that they are "not supposed to be that good in arithmetic" (2). It was further hypothesized that this developmental shift is reflected in boys' and girls' perception of their standing in reading, arithmetic, and spelling, as well as in their grades in these subjects. Thus, fourth-, fifth-, and sixth-grade girls' perception of their standing in reading and spelling can be expected to be less modest than that of boys. Girls' reading and spelling grades can also be expected to be superior to those of boys. In contrast, boys' perception of their standing in arithmetic, as well as their arithmetic grades, will not be inferior to that of girls.

It is recognized that grades may be a less objective index than the children's scores on standardized achievement tests. However, for the purposes of this study, report-card grades in reading, arithmetic, and spelling were judged to have greater utility as a criterion measure than the children's achievement-test scores. It seemed more probable that elementary school children perceive their standing among their peers on the basis of the grades they receive from their teachers than in terms of their achievement-test scores, and that children are much more likely to be cognizant of their classmates' grades than they are of the peers' achievement-test scores.

B. METHOD

1. *Subjects*

The subjects were 83 boys and 80 girls, all the pupils enrolled in the fourth, fifth, and sixth grades in a small suburban elementary school in New York State. There were two classes at each grade level. The community served by the school is predominantly middle class. The majority of the subjects have attended this school since kindergarten. The attainments of the pupils in this, as well as the other schools of the district, are well above the national norms of the standardized test of achievement.

2. *Procedure*

In each of the six classes, the children were told that a study was being conducted to "find out how well boys and girls in this school think they are doing in reading, arithmetic, and spelling." A prepared form was distributed on which the children were asked to indicate whether they believed they were in the "top" or "bottom half" of their classes in reading, arithmetic, and spelling. The children were also requested to name a classmate they believed did "about as well" as they did in reading, arithmetic, and spelling.

The reading, arithmetic, and spelling grades were transcribed from the pupils' report cards and converted into grade-point averages. The *IQ*'s (California Test of Mental Maturity) were transcribed from the cumulative records. Rosters were prepared for each class on which the report grades in reading, arithmetic, and spelling were entered. There were no grades for two fifth-grade girls who had recently entered the school and there were several children for whom no *IQ* score was entered on their cumulative-record form.

C. RESULTS

1. IQ *and Grades*

The boys ($M = 110.06$, SD 17.51) and girls ($M = 113.2$, SD 15.21) did not differ significantly ($t = 1.16$) in *IQ*.

Table 1 presents a comparison of the boys' and girls' mean grades in reading, arithmetic, and spelling. The girls' reading and spelling grades are significantly superior to those of the boys. The girls' superiority in arithmetic is not significant.

TABLE 1
COMPARISON OF FOURTH-, FIFTH-, AND SIXTH-GRADE BOYS' ($N = 83$) AND GIRLS' ($N = 78$) GRADES IN READING, ARITHMETIC, AND SPELLING

Variables	Mean	*SD*	*t*
Reading			
Boys	3.47	2.11	3.23**
Girls	4.33	1.97	
Arithmetic			
Boys	3.64	2.18	1.73
Girls	4.19	1.80	
Spelling			
Boys	4.29	2.38	2.85**
Girls	5.24	1.80	

** $p < .01$.

2. *Perception of Standing in Class*

The percentages of boys and girls perceiving themselves as standing in the top half of their classes in reading, arithmetic, and spelling are presented in Table 2. In reading and spelling, a greater self-favorability bias is found among girls than among boys. However, these differences, including that in spelling ($p = .10$), are not significant. A more impressive finding is the absence of a self-favorability bias among either boys or girls in arithmetic. Indeed, the proportion of boys or girls perceiving themselves in the top half of their classes in arithmetic does not actually reach 50 per cent.

TABLE 2

PERCENTAGES OF FOURTH-, FIFTH-, AND SIXTH-GRADE BOYS ($N = 83$) AND GIRLS ($N = 80$) PERCEIVING THEMSELVES IN THE TOP HALF OF THEIR CLASSES IN READING, ARITHMETIC, AND SPELLING

Variables	Boys %	Girls %	X^2	Sig.
Reading	57.5	65.0	.93	.90
Arithmetic	49.3	48.8	0	
Spelling	53.0	67.5	3.26	.10

3. *Peers Perceived as Equals in Ability*

The mean grades of the boys and girls and those of the peers they perceived as equals to themselves in reading, arithmetic, and spelling ability are presented in Table 3. None of the differences between the boys' and girls' mean grades and those of their perceived equals is significant. However, it is to be noted that the boys' peers' grades are superior to their own, but among the girls the grades of the peers perceived as equals are inferior in reading and arithmetic, but not in spelling.

TABLE 3

COMPARISON OF MEAN GRADES OF BOYS AND GIRLS IN READING, ARITHMETIC, AND SPELLING AND THOSE OF THE PEERS THEY PERCEIVED AS EQUAL IN ABILITY IN THESE SUBJECTS

	Boys			Girls		
Variables	Mean	*SD*	*t*	Mean	*SD*	*t*
Reading						
Subjects	3.47	2.11	.634	4.33	1.97	.251
Peers	3.68	2.14		4.25	2.00	
Arithmetic						
Subjects	3.64	2.18	1.13	4.19	1.80	1.31
Peers	4.02	2.12		4.55	1.59	
Spelling						
Subjects	4.29	2.38	1.84	5.24	1.80	1.31
Peers	4.97	2.29		5.42	1.59	

As equally unexpected as the absence of a significant self-favorability bias among either the boys or girls in the identification of subjective equals was the finding that several boys did not name peers. One high-achieving boy wrote, "really don't know" in place of a peer in arithmetic. Two low-achieving boys wrote, "no one" or "nobody" and named no peers as equal in ability in reading, arithmetic, and spelling.

4. *Developmental Shift*

The absence of significant differences between boys' and girls' perceptions of their standing in reading and spelling, in view of the highly significant superiority of the girls' grades in these subjects, suggested the possibility of the existence of a different relationship between boys' and girls' grades and perceptions of their standing at the fourth- and sixth-grade levels.

Table 4 presents a comparison of the boys' and girls' mean grades in reading, arithmetic, and spelling at the fourth- and sixth-grade levels. The fourth-grade girls' grades are significantly superior to those of the boys in reading and spelling. The girls' grades in arithmetic are also superior to those of boys, but not significantly so.

TABLE 4

MEAN GRADES IN READING, ARITHMETIC, AND SPELLING OF SIXTH-GRADE BOYS ($N = 23$) AND GIRLS ($N = 33$) AND FOURTH-GRADE BOYS ($N = 26$) AND GIRLS ($N = 17$)

	Sixth grade			Fourth grade		
Variables	Mean	*SD*	*t*	Mean	*SD*	*t*
Reading						
Boys	3.78	2.26	.447	3.46	2.27	1.731*
Girls	4.06	2.26		4.53	1.68	
Arithmetic						
Boys	3.52	1.93	.079	3.65	2.20	1.136
Girls	3.48	1.69		4.41	2.01	
Spelling						
Boys	4.22	1.89	1.44	3.96	2.01	2.6 **
Girls	4.94	1.67		5.47	1.68	

* $p < .05$.
** $p < .01$.

In contrast, the sixth-grade girls' grades are not significantly superior to those of the boys in either reading or spelling. While the difference is negligible, the boys' grades in arithmetic are actually superior to those of the girls.

The percentage of boys and girls in the fourth and sixth grades perceiving themselves as standing in the top half of their classes in reading, arithmetic, and spelling is presented in Table 5. A significantly greater self-favorability bias is found among girls at the fourth grade than among the boys in reading and spelling. A much more modest perception of their class standing is found among the girls in arithmetic, but the percentage of girls perceiving themselves as standing in the top half of their classes in arithmetic does exceed that of the boys.

TABLE 5

PERCENTAGE OF BOYS AND GIRLS PERCEIVING THEMSELVES IN THE TOP HALF OF THEIR CLASSES IN READING, ARITHMETIC, AND SPELLING IN THE SIXTH AND FOURTH GRADES

Variables	Sixth grade %	X^2	Fourth grade %	X^2
Reading				
Boys	52	.03	54	4.13*
Girls	54		83	
Arithmetic				
Boys	48	0	54	.23
Girls	48		61	
Spelling				
Boys	48	5.81***	50	7.17**
Girls	79		89	

* $p < .05$.
** $p < .02$.
*** $p < .01$.

In contrast, the differences between the percentage of sixth-grade girls and boys perceiving themselves in the top half of their classes in reading is negligible. Even more striking is the shift in arithmetic at the sixth-grade level, where only 48 per cent of the boys and girls perceive themselves as standing in the top half of their classes.

In spelling, a highly significant self-favorability bias exists among the sixth-grade girls. But, in contrast to the fourth-grade girls, the sixth-grade girls' spelling grades were not significantly superior to those of the sixth-grade boys. Nevertheless, 80 per cent of these girls perceived themselves as standing in the top half of their classes in spelling.

A table presenting the mean grades of the subjects and the peers they perceived as equal in ability in reading, arithmetic, and spelling is omitted because none of the 12 comparisons between the mean grades of the boys and girls and those of the peers they perceived as equal to themselves in reading, arithmetic, and spelling at either the fourth- or sixth-grade levels yielded a significant t value.

D. DISCUSSION

That girls' perceptions of their standing in reading and spelling, but not in arithmetic, were less modest than those of boys, and that their reading and spelling grades were significantly superior to those of boys, as predicted, obscure the two most important findings of this study. The first is that the closure of the academic gap between boys and girls during the middle grades appears to result more from a deceleration in girls' achievement than from an upsurge on the part of the boys. The second is that a different pattern exists in girls' perceptions of their standing in reading, arithmetic, and spelling at the fourth- and sixth-grade levels.

In reading, 83 per cent of the fourth-grade girls perceive themselves as standing in the top half of their classes; their reading grades were also significantly superior to those of the boys. But among the sixth-grade girls, only 54 per cent perceived themselves in the top half of their classes; their reading grades were not significantly superior to those of the sixth-grade boys. In arithmetic, less than 50 per cent of the sixth-grade girls and 61 per cent of the fourth-grade girls perceived themselves as standing in the top half of their classes. But the arithmetic grades of the fourth-grade girls were superior to those of the boys; the reverse was true at the sixth-grade level. In spelling at the fourth-grade level, 90 per cent, and at the sixth-grade level, 80 per cent of the girls perceived themselves as standing in the top half of their classes. The spelling grades of the fourth-, but not those of the sixth-grade girls were significantly superior to those of the boys.

This developmental shift was not reflected in either the boys' or girls' perceptions of peers equal to themselves in reading, arithmetic, or spelling. In contrast to the significant self-favorability bias among both boys and girls at the junior high school level, reported by Wylie (5), none of the 18 comparisons made between the grades of the boys and girls and those of their perceived equals yielded a significant difference. This absence of self-favorability bias suggests that these bright middle-class boys and girls perceive their academic achievement realistically, as well they might. Both their perceptions and performance are congruent with middle-class sex-role expectancies for academic achievement. Girls are supposed to be "good" in spelling, but "not that good in arithmetic." Kagan (1) suggests that this unfortunate marriage between domains of knowledge and male and female sex roles, unlike other undesirable psychological states, is not unalterable and may possibly be subject to modification through changes in the procedures and atmosphere of the elementary and high school. But, before the marriage can be dissolved, its existence needs to be recognized.

E. SUMMARY

Reading, spelling, and arithmetic grades of fourth-, fifth-, and sixth-grade children were compared with their perception of standing in top or bottom half of their classes and the grades of the peers the subjects perceived as

equal to themselves in achievement in each of these subjects. Girls' reading and spelling grades were significantly superior to those of boys; girls also showed a greater self-favorability bias than did boys. Arithmetic grades did not differ significantly and less than 50 per cent of both groups perceived themselves in the top half of their classes. Fourth-grade girls' reading and spelling grades and perception of standing were significantly superior to boys, but superiority in arithmetic was not significant. But grades of sixth-grade girls were not superior to those of boys and only in spelling did girls show a significantly greater self-favorability bias. No significant differences were found in any comparison between the subjects' grades and those of peers the subjects perceived as equals. Developmental shift in boys' and girls' grades and perceptions of standing were seen as consistent with middle-class sex-role expectancies for academic achievement.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 257-262.

EFFECTS OF PLACEBO AND AN ACETAMINOPHEN-SALICYLAMIDE COMBINATION ON MOODS, EMOTIONS, AND MOTIVATIONS*[1]

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A. INTRODUCTION

This paper is one in a series using essentially identical methods to study methodological problems of drug research and the actions of certain medications (1, 2, 3, 4, 5, 6, 7). These procedures were successful in meeting two criteria: to eliminate placebo effects; to make a sensitive assessment of drug-induced changes in a wide variety of moods, emotions, and motivations. The methodological problem of the validity of the obtained data cannot be evaluated from this single paper, but becomes clear from the totality of the results in the authors' series of reports, past and future.

There is a special reason for publication of the data on the present drug combination, shown in the authors' next paper: the acetaminophen-salicylamide combination has a very interesting potentiation effect when combined with dimenhydrinate (Dramamine).

This report describes the effects of placebo and a combination of acetaminophen (468 mg) and salicylamide (468 mg) on 78 male and 78 female college students who were 21 or older. Each volunteer received two placebo practice sessions, the data of which were not used. In addition each *S* received either two or three experimental placebo sessions for a total of 390 determinations. Each volunteer received either one or two administrations of the analgesic combination (for brevity this is referred to as MJ-122 in this report) for a total of 234 determinations. These were interspersed in a counterbalanced experimental design including other treatments (see B).

The data presented are from two adjective checklists. The short, forced-choice Adjective Check List, ACL (6, p. 207), contains 32 pairs of self-

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* Received in the Editorial Office, Provincetown, Massachusetts, on August 21, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This paper is number XIII of a series, "Chemical Studies of Behavior." The data here reported are part of a larger study carried out in 1965-1966. Support came from Menley & James and Smith Kline & French Laboratories and from the University of Rochester. The original data were independently processed by the authors and by another statistical laboratory.

descriptive adjectives plus other questions: e.g., degree of subjective awareness of drug effect. The long, free-choice Adjective Check List (6, p. 205), gives the subject the opportunity to select which of 133 adjectives apply to his feelings at that time.

B. PROCEDURES

The procedures of this study were substantially identical with previously reported studies. Each *S* completed all scheduled sessions, separated by two or more days. *S*s were assigned different drug sequences so as to counterbalance possible variable factors. On each day the *S* came twice, once in the late morning, when he filled out report forms, completed a free-choice ACL, and took his medication; again two hours after medication, to report on the two "outpatient" hours and to complete a free-choice ACL and a forced-choice ACL. The method was modified double-blind. Complete details of methods appear in earlier papers (2, 3, 5, 6, 7).

The placebo capsules contained milk sugar and were identical in appearance with those of all other treatments within a design.

The data collections for the 156 volunteers were divided into four phases, each with 39 *S*s. The details of the four experimental designs are as follows:

1. Thirty-nine male volunteers completed 14 sessions each, including two practice placebo, two experimental placebo, one Dramamine 80 mg, one Dexedrine 8 mg, two MJ-122, one aspirin 10 gr, one meprobamate 400 mg, one meprobamate-amphetamine combination, one Stelazine 2 mg, one amobarbital 30 mg S/R, and one Stelazine-amobarbital combination.

2. Thirty-nine female volunteers completed 16 sessions each, including two practice placebo, two experimental placebo, two Dramamine 50 mg, two Dexedrine 5 mg, and the remaining eight identical to those for the men.

3. Thirty-nine male volunteers completed 15 sessions each, including two practice placebo, three experimental placebo, one Dramamine 80 mg, two Dexedrine 8 mg, one MJ-122, one aspirin 15 gr, three MJ-122 combinations (one with 65 mg caffeine, one with 25 mg Dramamine, one with both caffeine and Dramamine), one Dexamyl (5 mg Dexedrine + 30 mg Amytal), and one Lucofen (25 mg chlorphentermine).

4. Thirty-nine female volunteers completed the identical design as No. 3 above with the exception that Dramamine was again reduced to 50 mg and Dexedrine to 5 mg.

C. RESULTS

1. *Results from the Short, Forced-Choice ACL*

a. Introduction. The forced-choice ACL consists of 32 pairs of adjectives arranged in alphabetical order: i.e., active—energetic, angry—annoyed, anxious

—fearful, etc. It is administered in each posttreatment session. The subject is required to make a judgment for each pair of adjectives of "whether you felt more that way before the drug took effect or whether you feel more that way now." This is done by circling either the word "before" or the word "now" adjacent to the adjective pair. In addition, *S*s answer three other questions:

> Which way of feeling did you like better? Before Now
> Do you believe that you felt any drug effects today?
> None——— Slight——— Moderate——— Strong———
> Completing this list today was:
> Difficult——— Moderately difficult———
> Moderately easy——— Easy———

b. Placebo and MJ-122 results on the forced-choice ACL. The 33 items of the ACL have been arranged into two major divisions: the first 16 items are normally associated with positive emotional states, the second group of 16 items is normally associated with negative states. One item, intoxicated—lightheaded, is separate because it can be associated with either positive or negative changes and is most often used by subjects to reflect the degree to which they feel affected by a drug.

Table 1 presents the results for the 390 determinations of placebo and 234 determinations of MJ-122. The list of items appears on the left; the first column gives the percentage choosing "now" after placebo; the second column gives the percentage of "nows" after MJ-122; and the third column gives the differences between them.

Only one difference (item 12) reached significance, which is what one would expect by chance.

The placebo data reflect a slight shift toward a relaxed positive mood, if one assumes that by complete chance 50 per cent of the *S*s would feel better and 50 per cent worse after a two-hour interval. The 16 positive items average 55 per cent and the 16 negative items average 43 per cent.

The MJ-122 results look very similar to placebo and yield very small differences. The pattern of these differences is such, however, to suggest that a small tranquilization effect may be present, that activity and drive may be lessened while, at the same time, relaxation and drowsiness is increased.

The volunteers apparently were not subjectively aware of any drug effect. In response to the question, "Do you believe that you felt any drug effect today?" both MJ-122 and placebo yielded the same percentage of *S*s who answered affirmatively: namely, 39 per cent.

2. *Results from the Long, Free-Choice ACL*

a. Introduction. The free-choice ACL consists of 133 adjectives alphabetically listed—i.e., active, affectionate, agreeable, ambitious, etc.—in vertical columns. The *S* checks or double-checks each adjective that describes his feelings at that time. The free-choice ACL is completed twice by the *S*, once before and once two hours after drug, yielding a *change score* for each of the adjectives which can then be totalled for the group of *S*s.

TABLE 1
FORCED-CHOICE ADJECTIVE CHECK LIST: MALE AND FEMALE DATA
COMPARING PLACEBO ($N = 390$) AND MJ-122 ($N = 234$)

Adjective pair	% "Nows" after placebo ($N = 390$)	% "Nows" after MJ-122 ($N = 234$)	MJ-122-placebo difference
1. active—energetic	54	46	— 8
2. cheerful—happy	58	57	— 1
3. decisive—capable	58	55	— 3
4. easygoing—relaxed	61	68	+ 7
5. egotistic—boastful	47	44	— 3
6. effective—efficient	57	53	— 4
7. genial—friendly	60	61	+ 1
8. humorous—witty	53	52	— 1
9. industrious—work-oriented	55	49	— 6
10. optimistic—high-spirited	54	51	— 3
11. quiet—peaceful	59	63	+ 4
12. reckless—uninhibited	49	39	—10
13. self-confident—courageous	57	54	— 3
14. sympathetic—considerate	56	59	+ 3
15. talkative—chatty	49	47	— 2
16. which way better	56	53	— 3
17. intoxicated—light-headed	56	55	— 1
18. angry—annoyed	40	38	— 2
19. anxious—fearful	41	35	— 6
20. bored—uninterested	45	47	+ 2
21. confused—disorganized	42	45	+ 3
22. disturbed—upset	39	39	0
23. downhearted—sad	44	46	+ 2
24. drowsy—sleepy	46	54	+ 8
25. dull—sluggish	45	53	+ 8
26. gloomy—blue	47	45	— 2
27. grouchy—irritable	39	42	+ 3
28. impatient—snappish	44	42	— 2
29. jittery—nervous	48	43	— 5
30. pain—discomfort	45	46	+ 1
31. resentful—indignant	42	40	— 2
32. self-conscious—timid	41	43	+ 2
33. tired—washed-out	47	54	+ 7

b. Change scores after placebo. The placebo data in this study are similar to our previous findings. The only consistent pattern other than random changes is that of postlunch relaxation and a drop in activity level.

c. Change scores after MJ-122. The 133 adjective change scores after MJ-122 are very similar to those after placebo, but with larger increases for such adjectives as drowsy, leisurely, calm, and subdued; and larger decreases for active, hardworking, and enthusiastic.

TABLE 2
FREE-CHOICE ADJECTIVE CHECK LIST: TOTAL CHANGE SCORES IN *a Priori* CLUSTERS AFTER PLACEBO AND MJ-122

Type of adjective and number of adjectives in cluster	Placebo ($N = 390$ adjusted to $N = 78$)	MJ-122 ($N = 234$ adjusted to $N = 78$)
1. Active, ambitious, energetic, industrious (13)	—44	—71
2. Elated, enthusiastic, self-confident, uninhibited (14)	—31	—55
3. Assertive, decisive, egotistic, boastful (12)	—24	—43
4. Disturbed, nervous, uneasy, upset (11)	—30	—23
5. Angry, belligerent, defiant, sarcastic (9)	—15	—22
6. Friendly, good-natured, trustful, warm-hearted (17)	—11	— 6
7. Apprehensive, careful, self-conscious (9)	—21	— 1
8. Blue, depressed, guilty, unhappy (9)	— 4	+ 4
9. Light-headed, dizzy, headache (6)	+11	+15
10. Apathetic, bored, indifferent, withdrawn (11)	+22	+28
11. Drowsy, lazy, sleepy, sluggish (8)	+15	+35
12. Calm, dreamy, drifting, relaxed (14)	+41	+53

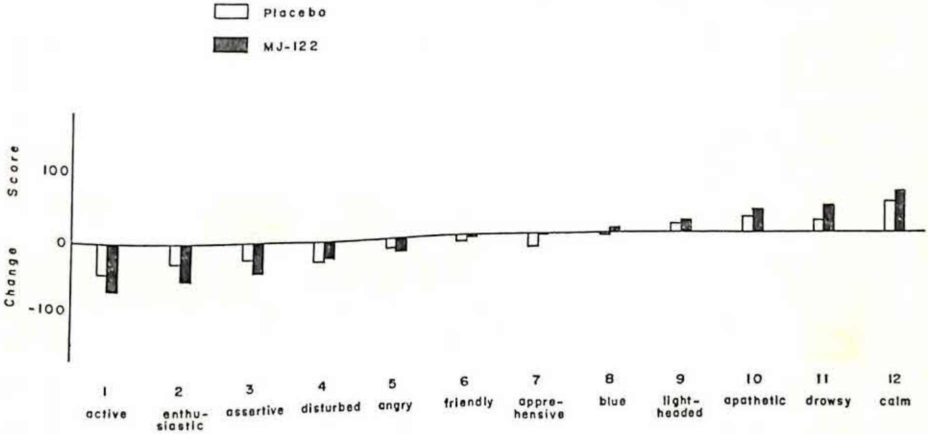

FIGURE 1
TOTAL CHANGE SCORES IN *a Priori* CLUSTERS AFTER PLACEBO ($N = 390$ ADJUSTED TO $N = 78$) AND MJ-122 ($N = 234$ ADJUSTED TO $N = 78$)

d. Total change scores for a priori *clusters.* The 133 adjectives of the free-choice ACL have been assigned to 12 clusters, selected to represent meaningful emotional and motivational states. A comparison of the 12 change scores after placebo with those after MJ-122 provides a condensed profile for the two treatments. Table 2 presents key adjectives for each cluster, the number of such adjectives in each, and the total change score per cluster for placebo and MJ-122. The *N*s for both treatments have been proportionately adjusted to $N = 78$ to facilitate comparison. Figure 1 shows the same data graphically.

The results of the free-choice ACL agree with those from the forced-choice ACL, indicating that MJ-122 effects closely resemble a postplacebo state and that MJ-122 has no significant effects on moods, emotions, or motivations except for a possible slightly tranquilizing effect.

D. SUMMARY

A combination of acetaminophen and salicylamide, administered to 78 men and 78 women was assessed by means of free-choice and forced-choice adjective checklists. The results of both methods showed that its effects on moods, emotions, and motivations were not significantly different from placebo except for a possible slightly tranquilizing effect.

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Published as a separate and in *The Journal of Psychology,* 1967, **67,** 263-270.

EFFECTS OF A DRAMAMINE-ANALGESIC-CAFFEINE COMBINATION ON MOODS, EMOTIONS, AND MOTIVATIONS*[1]

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A. INTRODUCTION

This report describes the effects of placebo and three combination compounds: (*a*) MJ-122,[2] an analgesic containing 486 mg acetaminophen and 486 mg salicylamide, plus 65 mg caffeine; (*b*) MJ-122 plus 65 mg caffeine plus 25 mg Dramamine (dimenhydrinate); and (*c*) MJ-122 plus 25 mg Dramamine. The procedures of this study were identical with previously reported studies undertaken to study methodological problems of drug research and the actions of specific medications (1, 2, 3, 4, 5, 6, 7, 8). The volunteers were 39 male and 39 female college students who were 21 years or older. Each *S* received three placebo treatments and one each of the combination treatments, interspersed among other treatments (see B). Comparison data of the effects of a larger dose of Dramamine (80 mg for men, 50 mg for women) are included.

The data presented are from two adjective checklists. The short, forced-choice Adjective Check List, ACL (7, p. 207), contains 32 pairs of self-descriptive adjectives plus other questions: e.g., degree of subjective awareness of drug effect. The long, free-choice Adjective Check List (7, p. 205) gives the subject the opportunity to select which of 133 adjectives apply to his feelings at that time.

The special points of interest in this paper are (*a*) the fact that the ACL methods were sensitive to the expected directions of drug action and (*b*) an interesting synergistic effect (potentiation) when acetaminophen, salicylamide, and dimenhydrinate were combined.

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* Received in the Editorial Office, Provincetown, Massachusetts, on August 21, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This paper is number XIV of a series, "Chemical Studies of Behavior." The data here reported are part of a larger study carried out in 1965-1966. Support came from Menley & James and Smith Kline & French Laboratories and from the University of Rochester. The original data were independently processed by the authors and by another statistics laboratory.

[2] The substance MJ-122 was supplied by Menley & James Laboratories, Philadelphia, Pennsylvania.

B. Procedures

Each *S* served for 15 sessions, separated by two or more days, during which a variety of experimental and control doses were used (placebo, Dramamine, Dexedrine, two appetite suppressants—Lucofen and Dexamyl—and the treatments that are the subject of this paper). The *S*s were assigned different drug sequences so as to counterbalance possible variable factors. On each day the *S* came twice, once in the late morning, when he filled out report forms, completed a free-choice ACL, and took his medication; again, two hours after medication, to report on the two "outpatient" hours and to complete both a free-choice ACL and a forced-choice ACL. The method was modified double-blind. Complete details of methods appear in earlier papers (2, 3, 7, 8). All *S*s completed all scheduled sessions.

The placebo capsules contained milk sugar and were identical in appearance with those for all treatments.

C. Results

1. *Results from the Short, Forced-Choice ACL*

a. Introduction. The forced-choice ACL consists of 32 pairs of adjectives arranged in alphabetical order: i.e., active—energetic, angry—annoyed, anxious—fearful, etc. It is administered in each posttreatment session. The subject is required to make a judgment for each pair of adjectives of "whether you felt more that way before the drug took effect or whether you feel more that way now." This is done by circling either the word "before" or the word "now" adjacent to the adjective pair. In addition, *S*s answer three other questions:

Which way of feeling did you like better? Before Now
Do you believe that you felt any drug effects today?
None——— Slight——— Moderate——— Strong———
Completing this list today was:
Difficult——— Moderately difficult———
Moderately easy——— Easy———

The 33 items of the ACL have been arranged into two major divisions: the first 16 items are normally associated with positive emotional states, the second group of 16 items are normally associated with negative states. One item, intoxicated—light-headed, is separate because it can be associated with either positive or negative changes and is most often used by subjects to reflect the degree to which they feel affected by a drug.

b. Forced-Choice ACL results on placebo and the three combinations. Table 1 presents the data for the 78 *S*s. For each treatment the frequency

TABLE 1

Forced-Choice Adjective Check List: Data Comparing Placebo, MJ-122 + Caffeine, MJ-122 + Caffeine + Dramamine, MJ-122 + Dramamine, and Dramamine

Adjective pair	Placebo ($N = 234$)	MJ-122 + Caffeine ($N = 78$)			MJ-122 + Caff + Dram ($N = 78$)			MJ-122 + Dramamine ($N = 78$)			Dramamine ($N = 78$)		
	% Nows	% Nows	Diff	t	% Nows	Diff	t	% Nows	Diff	t	% Nows	Diff	t
1. active—energetic	52	62	+10	*	38	—14	—2.19	29	—23	—3.78	14	—38	—7.44
2. cheerful—happy	60	64	+ 4		42	—18	—2.79	35	—25	—3.98	21	—39	—6.95
3. decisive—capable	56	55	— 1		45	—11		29	—27	—4.44	21	—35	—6.21
4. easygoing—relaxed	62	60	— 2		59	— 3		55	— 7		53	— 9	
5. egotistic—boastful	46	46	0		40	— 6		22	—24	—4.20	18	—28	—5.15
6. effective—efficient	56	60	+ 4		47	— 9		31	—25	—4.06	17	—39	—7.29
7. genial—friendly	62	68	+ 6		49	—13	—2.00	36	—26	—4.13	31	—31	—5.06
8. humorous—witty	56	54	— 2		40	—16	—2.49	27	—29	—4.85	22	—34	—5.96
9. industrious—work-oriented	54	58	+ 4		42	—12		33	—21	—3.36	18	—36	—6.62
10. optimistic—high-spirited	55	59	+ 4		38	—17	—2.66	28	—27	—4.47	17	—38	—7.10
11. quiet—peaceful	61	58	— 3		67	+ 6		68	+ 7		72	+11	
12. reckless—uninhibited	50	54	+ 4		33	—17	—2.72	31	—19	—3.08	24	—26	—4.45
13. self-confident—courageous	57	58	+ 1		46	—11		29	—28	—4.61	21	—36	—6.39
14. sympathetic—considerate	56	54	— 2		42	—14	—2.17	44	—12		33	—23	—3.69
15. talkative—chatty	50	56	+ 6		38	—12		26	—24	—4.04	17	—33	—6.15
16. which way better	56	60	+ 4		44	—12		32	—24	—3.87	19	—37	—6.73
17. intoxicated—light-headed	60	60	0		56	— 4		54	— 6		81	+21	+3.83
18. angry—annoyed	41	41	0		46	+ 5		51	+10		50	+ 9	
19. anxious—fearful	42	37	— 5		44	+ 2		51	+ 9		47	+ 5	
20. bored—uninterested	46	38	— 8		53	+ 7		73	+27	+4.51	85	+39	+7.51
21. confused—disorganized	42	38	— 4		55	+13	+2.00	65	+23	+3.66	74	+32	+5.40
22. disturbed—upset	38	37	— 1		50	+12		56	+18	+2.79	53	+15	+2.31
23. downhearted—sad	43	44	+ 1		51	+ 8		72	+29	+4.81	73	+30	+5.02
24. drowsy—sleepy	47	40	— 7		56	+ 9		73	+26	+4.34	85	+38	+7.31
25. dull—sluggish	47	46	— 1		56	+ 9		72	+25	+4.14	88	+41	+8.34
26. gloomy—blue	47	41	— 6		56	+ 9		62	+15	+2.35	76	+29	+4.97
27. grouchy—irritable	38	40	+ 2		47	+ 9		60	+22	+3.44	56	+18	+2.79
28. impatient—snappish	44	42	— 2		46	+ 2		55	+11		51	+ 7	
29. jittery—nervous	48	50	+ 2		50	+ 2		42	— 6		46	— 2	
30. pain—discomfort	44	44	0		44	0		55	+11		58	+14	+2.17
31. resentful—indignant	39	41	+ 2		47	+ 8		44	+ 5		44	+ 5	
32. self-conscious—timid	41	42	+ 1		54	+13	+2.00	54	+13	+2.00	65	+24	+3.82
33. tired—washed-out	48	41	— 7		60	+12		74	+26	+4.37	87	+39	+7.77

* None of the differences between MJ-122 + Caffeine and Placebo reached significance.

of "now" responses is given for the 33 items, with placebo differences, and *t*'s when significant.

The three compounds form a sensible continuum, with MJ-122 + caffeine eliciting a positive or near placebo response, MJ-122 + caffeine + Dramamine giving a more negative than placebo response, and MJ-122 + Dramamine giving quite a strong negative response. In fact, the MJ-122 + Dramamine gives qualitatively the same responses as Dramamine alone. From the magnitude of the shift after the compound, it would appear that the MJ-122 potentiates the 25 mg of Dramamine into resembling quantitatively the change after 80 mg and 50 mg Dramamine for men and women respectively. It is possible that this potentiation of Dramamine is what limits or masks the beneficial effects of caffeine in the compound including the three substances.

c. Subjective report of drug effect. The influence of Dramamine in causing the *S*s to report feeling a drug effect in response to the question, "Did you feel any drug effect today?" is reflected by the results presented in Table 2. The full dose of Dramamine caused only an eight per cent increase over MJ-122 plus 25 mg Dramamine, with or without caffeine added.

TABLE 2
SUBJECTIVE REPORT OF DRUG EFFECT

Drug	% Reporting effects	Drug-Placebo difference	t
Placebo ($N = 234$)	38		
MJ-122 + caffeine ($N = 78$)	49	+11%	N.S.
MJ-122 + caffeine + Dramamine ($N = 78$)	64	+26	+4.13
MJ-122 + Dramamine ($N = 78$)	64	+26	+4.13
Dramamine ($N = 78$)	72	+34	+5.67

2. *Results from the Long, Free-Choice ACL*

a. Introduction. The free-choice ACL consists of 133 adjectives alphabetically listed—i.e., active, affectionate, agreeable, ambitious, etc.—in vertical columns. The *S* checks or double-checks each adjective that describes his feelings at that time. The free-choice ACL is completed twice by the *S*, once before and once two hours after drug, yielding a *change score* for each of the adjectives which can then be totalled for the group of *S*s.

b. Change scores after MJ-122 + caffeine. The change scores reflect the absence of after-lunch-let-down and the retention of positive mood states. Adjectives that have an increase in check marks are good-natured, energetic, optimistic, and dreamy. Adjectives that have a decrease in check marks are uneasy, dissatisfied, and worried.

c. Change scores after MJ-122 + caffeine + Dramamine. The addition of the Dramamine causes a reversal from the above. Negative adjectives have an increase in check marks: e.g., sluggish, drowsy, indifferent, washed-out; and positive adjectives have a decrease in check marks: e.g., ambitious, cheerful, eager, attentive, active, and confident.

d. Change scores after MJ-122 + Dramamine. The absence of caffeine in the compound is definitely reflected in the magnitude of change scores and represents a substantial shift toward negative emotional and motivational states. While the data are in excellent agreement, it would appear that the male group was more affected and reported a higher degree of tranquilization and depression than the women. The change scores for both groups of subjects are qualitatively similar to those after Dramamine, with the majority of negative adjectives having an increase in check marks and positive ones having a decrease in check marks.

e. Total change scores for a priori *clusters.* Twelve groups of adjectives have been selected from the ACL to represent meaningful emotional and motivational states and give a convenient way to summarize 133 adjective change scores. Table 3 presents these scores for the three compounds. In addition the authors have included the scores for placebo and Dramamine in order to present the complete continuum: slight mood elevation after MJ-122 + caffeine, normal after-lunch-let-down after placebo, the increasingly negative shift as Dramamine is added and caffeine is subtracted, and lastly Dramamine alone. Figure 1 shows the same data graphically.

D. COMMENTS

The various combinations of MJ-122, caffeine, and Dramamine showed different effects on moods, emotions, and motivations, and these were in directions to be expected:

1. MJ-122 (15 gr) + caffeine (65 mg) resulted in slight mood improvement.

2. MJ-122 alone showed effects like placebo except for a slight tranquilizing effect (6).

3. MJ-122 + caffeine + Dramamine (25 mg) showed moderate mood depression.

4. MJ-122 + Dramamine showed fairly strong mood depression.

5. Dramamine alone (80 mg for men, 50 mg for women) showed only slightly stronger mood depression than the combination of 25 mg Dramamine with MJ-122. Tests of combinations of Dramamine with acetaminophen and

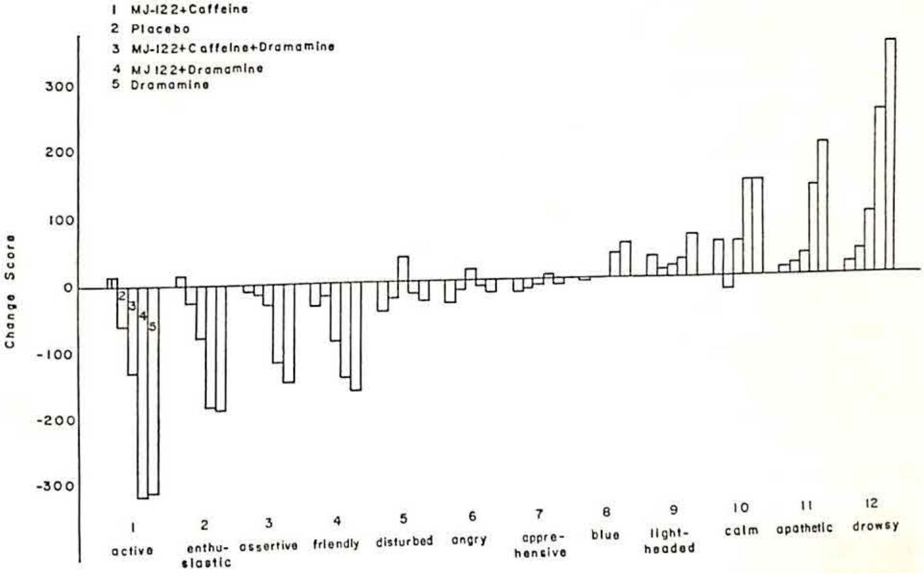

FIGURE 1

Total Change Scores in *a Priori* Clusters After MJ-122 + Caffeine ($N = 78$), Placebo ($N = 234$ Adjusted to $N = 78$), MJ-122 + Caffeine + Dramamine ($N = 78$), MJ-122 + Dramamine ($N = 78$), and Dramamine ($N = 78$)

with salicylamide would be required to find whether the synergism of Dramamine is due to one of these only, or whether all three components are involved.

E. Summary

Acetaminophen plus salicylamide was combined with caffeine, with caffeine and dimenhydrinate, and with dimenhydrinate alone for administration to 39 males and 39 females. The effects were measured by forced-choice and free-choice adjective checklists. The effects of the three combinations were compared to those of dimenhydrinate alone, of the acetaminophen-salicylamide combination alone, and placebo. The sequence of effects, from slight mood improvement to considerable sedation were (*a*) acetaminophen-salicylamide-caffeine; (*b*) placebo, slight relaxation, (*c*) acetaminophen-salicylamide; (*d*) acetaminophen-salicylamide-caffeine-dimenhydrinate; (*e*) acetaminophen-salicylamide-dimenhydrinate, (*f*) dimenhydrinate. Dimenhydrinate (25 mg) combined with acetaminophen-salicylamide had effects qualitatively and quantitatively similar to those of 80 mg or 50 mg of dimenhydrinate.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 271-276.

LEARNING AND RETENTION AS A FUNCTION OF INSTRUCTIONAL METHOD AND RACE*[1]

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A. INTRODUCTION

There has been considerable interest in programmed textbooks over the past decade, and with improvements in electronic computers, there is likely to be increasingly extensive use of programmed texts in the future. The nature and quality of Negro education has also been a topic of public and scholarly discussion (2, 6). An opportunity for one of the authors to teach simultaneously at a predominantly Caucasian university and a predominantly Negro university provided the means for studying both of these problems.

Programmed textbooks have a number of features that facilitate learning. They require the active participation of the student, they provide immediate correction of errors or confirmation of correctness, and they enable each student to proceed at his own speed. Several studies that have compared the programmed textbook method with conventional methods of instruction have demonstrated that the programmed textbook method is either equally effective to or more effective than the conventional method (4, 7, 8).

The present study involved two basic comparisons: (*a*) one between students taught by conventional procedures—lecture and discussion—and students taught by a programmed textbook; and (*b*) a second comparison between Caucasian students and Negro students. The use of a programmed text in the present comparison between white and Negro students was advantageous because it permitted standardization of the material to be learned.

B. METHOD

1. *Subjects*

For the conventional *vs.* programmed text instruction comparison, 25 white students were matched with 25 other white students on the basis of sex, age, *IQ* (Vocabulary Test of the Shipley-Hartford Intelligence Test, 1940), and

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* Received in the Editorial Office, Provincetown, Massachusetts, on August 24, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This paper was presented at a convention of the Southeastern Psychological Association, Atlanta, Georgia, April, 1967.

Pretest scores on the information that was to be covered in the text or lecture. The students were selected from among two educational psychology classes at Louisiana State University. For the second comparison, 15 Negro students from an educational psychology class at Southern University, a Negro university, were matched with 15 white students in the programmed text group at Louisiana State University on the basis of sex, age, *IQ*, and Pretest scores. There were two Programmed Text-Caucasian groups, one with an N of 25 which was compared with the Lecture-Caucasian group, and one with an N of 15 which was compared with the Programmed Text-Negro group. The groups were predominantly female, 21 females to four males in the larger groups, and 13 females to two males in the smaller groups. The groups' respective average *IQ* scores were Lecture-Caucasian ($N = 25$), 114.9; Programmed Text-Caucasian ($N = 25$), 115.0; Programmed Text-Caucasian ($N = 15$), 112.2; and Programmed Text-Negro ($N = 15$), 110.4.

All students completed the Edwards Personal Preference Schedule, EPPS, (3), a personality test which measures 15 personality traits. The students under the programmed text conditions also completed a short questionnaire regarding their opinion of programmed instruction.

2. *Instruction*

The programmed textbook consisted of pages 1-202 of the Holland and Skinner book "The Analysis of Behavior" (5). Pages of mimeographed text were distributed to the students on each of ten 50-minute class periods over a time span of two weeks. The text is a linear type program which deals with the topics of learning and motivation. The students were instructed to cover the answers provided in the left-hand margin with a piece of fiberboard, read the item and answer the question, check to see whether or not they were correct by exposing the answer in the margin, and then go on to the next item. The program is constructed in such a way that the student is usually correct in his answers. A teacher was present in the room at all times to see that directions were followed and to answer any questions that might arise.

The Lecture group, on the other hand, received lecture and discussion on the same material over the same two-week period. An effort was made to have the content covered in the lectures identical to the material presented by the programmed textbook. The lecturer helped prepare the Posttest and gave lectures on all the material covered by the questions of the Posttest. All of the groups were attending regularly scheduled classes. No group was informed that comparisons were to be made between themselves and any other group.

3. *Procedure*

The same Pretest, Posttest, and Retention test was administered to all groups. The Pretest was administered at the first class meeting. Then, after 10 days of classroom instruction, the same test was readministered. Finally, six weeks after the Posttest, the same test was administered a third time in order to assess retention. The Posttest was announced beforehand, but the Retention Test was not. The order of conditions was thus as follows: Pretest, instruction, Posttest, an interval of six weeks during which time students completed the remainder of their educational psychology courses, and Retention Test.

C. RESULTS

The results of the Pretest, Posttest, and Retention Test are summarized in Table 1.

TABLE 1
GROUP SCORES ON PRETEST, POSTTEST, AND RETENTION TEST

	Pretest		Posttest		Retention Test	
Group	*M*	*SD*	*M*	*SD*	*M*	*SD*
Lecture—Cauc. ($N = 25$)	31.0	7.98	72.8	10.09	74.0	8.13
Prog. Text—Cauc. ($N = 25$)	30.4	8.24	83.7	15.11	77.6	12.46
Prog. Text—Cauc. ($N = 15$)	28.1	5.29	83.9	12.63	78.0	10.67
Prog. Text—Negro ($N = 15$)	27.6	5.07	58.8	17.39	57.2	18.38

There were no statistically significant differences between any groups on the Pretest. On the Posttest, however, both the Lecture *vs.* Programmed Text comparison, and the Caucasian *vs.* Negro comparison yielded significant differences. The Programmed Text-Caucasian group received reliably higher scores than the Lecture-Caucasian group ($t = 2.97$, $df = 48$, $p < .01$). The difference between these groups was also evident in the reliably greater increase in scores from Pretest to Posttest for the Programmed Text-Caucasian group ($t = 3.39$, $df = 48$, $p < .01$). The Programmed Text-Caucasian group achieved a reliably higher score on the Posttest than the Programmed Text-Negro group ($t = 4.37$, $df = 28$, $p < .01$) and showed a reliably greater increase in scores from Pretest to Posttest ($t = 4.76$, $df = 28$, $p < .01$).

Although there was some variation in retention, Posttest minus Retention Test scores did not vary significantly for either of the comparisons. The lack of reliable differences in decrement of scores indicates that no group showed superior retention.

Pretest scores on the information that was to be covered in the text or lecture. The students were selected from among two educational psychology classes at Louisiana State University. For the second comparison, 15 Negro students from an educational psychology class at Southern University, a Negro university, were matched with 15 white students in the programmed text group at Louisiana State University on the basis of sex, age, *IQ*, and Pretest scores. There were two Programmed Text-Caucasian groups, one with an N of 25 which was compared with the Lecture-Caucasian group, and one with an N of 15 which was compared with the Programmed Text-Negro group. The groups were predominantly female, 21 females to four males in the larger groups, and 13 females to two males in the smaller groups. The groups' respective average *IQ* scores were Lecture-Caucasian ($N = 25$), 114.9; Programmed Text-Caucasian ($N = 25$), 115.0; Programmed Text-Caucasian ($N = 15$), 112.2; and Programmed Text-Negro ($N = 15$), 110.4.

All students completed the Edwards Personal Preference Schedule, EPPS, (3), a personality test which measures 15 personality traits. The students under the programmed text conditions also completed a short questionnaire regarding their opinion of programmed instruction.

2. *Instruction*

The programmed textbook consisted of pages 1-202 of the Holland and Skinner book "The Analysis of Behavior" (5). Pages of mimeographed text were distributed to the students on each of ten 50-minute class periods over a time span of two weeks. The text is a linear type program which deals with the topics of learning and motivation. The students were instructed to cover the answers provided in the left-hand margin with a piece of fiberboard, read the item and answer the question, check to see whether or not they were correct by exposing the answer in the margin, and then go on to the next item. The program is constructed in such a way that the student is usually correct in his answers. A teacher was present in the room at all times to see that directions were followed and to answer any questions that might arise.

The Lecture group, on the other hand, received lecture and discussion on the same material over the same two-week period. An effort was made to have the content covered in the lectures identical to the material presented by the programmed textbook. The lecturer helped prepare the Posttest and gave lectures on all the material covered by the questions of the Posttest. All of the groups were attending regularly scheduled classes. No group was informed that comparisons were to be made between themselves and any other group.

3. *Procedure*

The same Pretest, Posttest, and Retention test was administered to all groups. The Pretest was administered at the first class meeting. Then, after 10 days of classroom instruction, the same test was readministered. Finally, six weeks after the Posttest, the same test was administered a third time in order to assess retention. The Posttest was announced beforehand, but the Retention Test was not. The order of conditions was thus as follows: Pretest, instruction, Posttest, an interval of six weeks during which time students completed the remainder of their educational psychology courses, and Retention Test.

C. RESULTS

The results of the Pretest, Posttest, and Retention Test are summarized in Table 1.

TABLE 1
GROUP SCORES ON PRETEST, POSTTEST, AND RETENTION TEST

Group	Pretest		Posttest		Retention Test	
	M	*SD*	*M*	*SD*	*M*	*SD*
Lecture—Cauc. ($N = 25$)	31.0	7.98	72.8	10.09	74.0	8.13
Prog. Text—Cauc. ($N = 25$)	30.4	8.24	83.7	15.11	77.6	12.46
Prog. Text—Cauc. ($N = 15$)	28.1	5.29	83.9	12.63	78.0	10.67
Prog. Text—Negro ($N = 15$)	27.6	5.07	58.8	17.39	57.2	18.38

There were no statistically significant differences between any groups on the Pretest. On the Posttest, however, both the Lecture *vs.* Programmed Text comparison, and the Caucasian *vs.* Negro comparison yielded significant differences. The Programmed Text-Caucasian group received reliably higher scores than the Lecture-Caucasian group ($t = 2.97$, $df = 48$, $p < .01$). The difference between these groups was also evident in the reliably greater increase in scores from Pretest to Posttest for the Programmed Text-Caucasian group ($t = 3.39$, $df = 48$, $p < .01$). The Programmed Text-Caucasian group achieved a reliably higher score on the Posttest than the Programmed Text-Negro group ($t = 4.37$, $df = 28$, $p < .01$) and showed a reliably greater increase in scores from Pretest to Posttest ($t = 4.76$, $df = 28$, $p < .01$).

Although there was some variation in retention, Posttest minus Retention Test scores did not vary significantly for either of the comparisons. The lack of reliable differences in decrement of scores indicates that no group showed superior retention.

Analysis of the data from the EPPS showed that the 15 Negroes scored higher on need for Achievement and lower on needs for Affiliation and Exhibitionism than the 15 white students ($t = 2.29$, $df = 28$, $p < .05$; $t = 2.37$, $df = 28$, $p < .05$; and $t = 2.78$, $df = 28$, $p < .01$; respectively). Programmed Text-Caucasian students had higher scores on Succorance than Lecture-Caucasian students ($t = 3.30$, $df = 48$, $p < .01$).

The students' reaction to programmed text instruction was indicated in their responses to an anonymously completed questionnaire. White students checked significantly more often than the Negro students that they felt they were being treated like "an experimental organism." Negro students, on the other hand, checked significantly more often that they felt "the instructor was trying to teach me as much as possible within a given expenditure of time and effort." ($\chi^2 = 9.78$, $df = 3$, $p < .05$.) Although Negroes checked more positive items than did whites, a statistical analysis of all of the responses showed no significant difference between racial groups in favorableness of attitude toward programmed textbook instruction.

D. Discussion

The superior performance on the Posttest of the Programmed Text group is additional evidence for the efficacy of programmed instruction. In this study programmed instruction was more effective than instruction by the conventional means of lecture and discussion. There are some important reservations to bear in mind, however. The major limitation of the present study is that programmed instruction was compared with the instruction of one particular lecturer. Other lecturers might possibly have been able to communicate the information more effectively. A more adequate design would include a larger sample of lecturers than that in the present study. Prior research by Roe (8) indicates that no difference would have been likely to result from using individual booths for studying instead of an open classroom, but there are undoubtedly many variables which could have changed the results. It can be properly said, however, that under the circumstances of the present experiment, programmed instruction was more effective than conventional instruction.

Although it also can properly be said that under the present circumstances, white students learned more than did Negro students, care should be taken that the results are not misinterpreted. Racial differences in intelligence test performances have generally been interpreted in terms of past and present environmental differences (1, 2). An environmental explanation would also be appropriate and adequate for the present data. The Negroes in the present study came from South Central segregated schools and were currently attending a Negro university. Although there has been some effort to equalize white and Negro schools over the past 10 years, it is clear to most objective observers that Negro schools have not been, and are not now, equal to their white counterparts. The major expenditures over the past 10 years have been directed toward such visible items as school buildings rather than toward enrichment of the educational experience *per se*. In higher education too, the pattern of separate but unequal education continues (6). In regard to the present experiment, it may be reasonably inferred that although white and Negro students were equated in regard to intelligence, they differed in quality of academic background. The difference may be reflected in such intellectual skills as learning how to learn or in concept learning; or it may be reflected in such nonintellectual factors as self-confidence, attitudes toward educational tasks, motivation, etc. The EPPS results indicate that motivational differences were present, but the manner in which such differences affected the results is difficult to determine. It would seem that the higher need for achievement of the Negroes would have facilitated performance. Perhaps it did, but its influence was eclipsed by the influence of strongly detrimental factors.

Physical factors could also have been important. There was a marked difference between white and Negro classrooms. The classroom in which the white students worked was large and air-conditioned. The classroom of the Negroes, on the other hand, was cramped and not air-conditioned. The specification of the particular factors responsible for the difference in performance, whether academic, motivational, or physical, can be identified through further research.

E. SUMMARY

Comparisons were made between programmed instruction and conventional instruction and between Caucasian and Negro university students. *S*s were matched on sex, age, *IQ*, and Pretest scores. They were taught the same material for two weeks with either a programmed text, "The Analysis of Behavior" by Holland and Skinner, or by conventional methods. Posttest scores were reliably higher for students taught by programmed text than for students taught by conventional instruction and for Caucasian students than for Negro students. Racial differences on the Posttest were attributed to past and present environmental differences between segregated schools. A Retention Test administered six weeks later showed no differential loss in retention.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 277-285.

CONGRUENCE OF THE DIMENSIONS OF SELF-AS-OBJECT AND SELF-AS-PROCESS*

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A. PROBLEM

That the construct *self-concept* is considered a psychologically meaningful variable is evident from the voluminous studies in the literature dealing with this variable. Hall and Lindsey (7) and Coleman (3) distinguish two meanings of the term *self:* (*a*) self-as-object, a cluster of attitudes and sentiments the individual has about himself; and (*b*) self-as-process, a group of psychological processes that function as determinants of behavior. The latter concept implies a structural or integrating aspect of behavior (3, 9) and would appear to correspond with "the integrated pilot of the organism" (1), and could be measured within the framework of personality factors, such as those assessed by Cattell's Sixteen Personality Factor Questionnaire.

Failure on the part of personality theorists and research workers to state clearly the view of self-concept with which they are dealing has resulted in a mass of confused data, conspicuously lacking a distinguishable theoretical frame of reference. In her review, Wylie (10) concluded in part that the existing self-concept theories were vague, incomplete, and lacking empirical support. This point is reiterated by Gaier and White (6), who commented on the current status of self-concept research.

Perhaps one reason for the above criticism is that the usual practice of researchers is to define self-concept in terms of the measuring instruments employed in their particular study. A variety of instruments have been used to assess self-concept (adjective checklists, *Q*-sorts, inventories, semantic differentials, etc.). What has resulted is *not* a clarification of the self-concept variable, but a conglomeration of operational definitions inadequately related empirically or theoretically.

Empirical data are needed to determine: (*a*) the dimensions of self-as-object and self-as-process and whether these two constructs are independent, and (*b*) what dimensions of these two constructs are being measured by the existing assessment techniques.

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* Received in the Editorial Office, Provincetown, Massachusetts, on August 31, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

The general purpose of the present study was to determine, in a multivariate design, whether the dimensions of self-as-object are in fact dimensions of the same phenomenon as self-as-process. Specifically, it was hypothesized that instruments purporting to measure self-as-object are assessing dimensions of the same phenomenon as a standard personality inventory (i.e., self-as-process).

B. Method

1. *Subjects*

The *S*s were 138 college students, of which 81 were female, enrolled in two sections of educational psychology, during the spring of 1966, at the University of Georgia.

2. *Instrumentation*

The Sixteen Personality Factor Questionnaire, Form A, 16 PF (2), was used as the measure of self-as-process.

Self-concept instruments directed toward self-as-object are numerous; however, none is widely accepted. Two were selected for this study based on several criteria. Aside from theoretical considerations, the instruments had been shown to be reliable, applicable to group administration, and relatively simple to score. A reasonable assumption would be that multidimensional instruments provide a wider range of information than single-score instruments. A second assumption was that the instruments were representative of instruments purporting to assess the self-as-object aspect of the self-concept.

Tennessee (Department of Mental Health) Self-Concept Scale, TSCS (5) consists of 100 self-descriptive items to which *S*s respond on a five-point bipolar scale (True *vs.* False), according to their perception of the degree that the item applies to themselves. An equal distribution of 90 positive and negative items comprises the eight subscales defining Self-Esteem. Ten positive items comprise a Self-Criticism subscale. A number of derived scores and special purpose scales can be obtained. For purposes of the study, scores were obtained for nine subscales (Self-Criticism, Identity, Self-Satisfaction, Behavior, Physical-Self, Moral-Ethical-Self, Personal-Self, Family-Self, and Social-Self) and three of the derived scores (Variability, Conflict, Certainty). Reported test-retest reliabilities for these 12 subscales range from .67 to .91, with three falling below .80.

An adaptation of Osgood's Semantic Differential, SD (8) was constructed containing 12 bipolar adjective pairs, requiring ratings on a seven-point scale. Selections of the bipolar scales were based on criteria given by Osgood *et al.*

(8). Four scales for each of the three principal semantic factors were included: Evaluation (unpleasant-pleasant, happy-sad, good-bad, unfair-fair); Potency (large-small, thin-thick, weak-strong, heavy-light); Activity (fast-slow, dull-sharp, hot-cold, passive-active). The adjective scales were randomly ordered and polarized. *S*s rated two concepts, *My Actual-Self* and *My Ideal-Self*. The order of presentation of the concepts to be rated was also randomized.

3. *Procedure*

The instruments were administered during the regular class period of approximately 50 minutes on two successive days. The TSCS and SD were administered the first day with the order of presentation varied. The 16 PF was administered the second day. *S*s supplied information regarding age, sex, and grade classification. The instruments were scored, and raw scores obtained on the 52 test variables (16 PF, 16; TSCS, 12; SD, 24) constituted the initial data.

The 36 test variables (the TSCS, SD Ideal, and SD Actual) assumed to measure the self-as-object were factor analyzed by means of a principal axes solution. Since unities were employed throughout the principal diagonal of the correlation matrix, those factors with latent roots greater than one were preserved for rotation. Nine such factors were extracted, together accounting for 70 per cent of the total test variance. These nine factors were then rotated to the varimax criterion, and factor scores were determined for all *S*s from the rotated factor structure. Finally, the self-as-process factors (i.e., 16 PF scores) and the self-as-object factors were correlated by the canonical method.

C. RESULTS

Table 1 presents the major rotated factor loadings for the factor structure of the self-as-object variables. Factor I has high loadings in all eight of the primary subscales of the TSCS. It would seem that this factor is one of *Self-Acceptance*. Fitts (5) described the major dimension measured by the TSCS as Self-Esteem, and pointed to Certainty as an independent dimension. However, the presence of a substantial loading for Certainty on Factor I suggests a factor of positive *Self-Acceptance*.

Factor II is a semantic factor of Potency. Substantial loadings in the Potency scales: large-small, thick-thin, heavy-light, representing the judgments on both Actual-Self and Ideal-Self suggest generality across these two concepts; and it seemed appropriate to label Factor II *Self-Strength*.

Similarly, Factor III represents the Activity factor with loadings in the scales: fast-slow, dull-sharp, weak-strong. This factor shows the same cross-concept generality observed in Factor II. Thus, Factor III was called *Self-Activity.*

Factors IV and VI both have correspondence with Osgood's Evaluation dimension. However, the cross-concept generality does not appear for these

TABLE 1
MAJOR ROTATED FACTOR LOADINGS FOR THE FACTOR STRUCTURE OF SELF-AS-OBJECT SCALES*

Scales	Test	Factors I	II	III	IV	V	VI	VII	VIII	IX	h²
Identity	TSCS	81									79
Self-Satisfaction	TSCS	87									87
Behavior	TSCS	82									80
Physical-Self	TSCS	73									64
Moral-Ethical-Self	TSCS	81									74
Personal-Self	TSCS	79									79
Family-Self	TSCS	81									70
Social-Self	TSCS	61									59
Certainty	TSCS	79									83
Large-Small	SDA		71								64
Large-Small	SDI		83								76
Thin-Thick	SDA		—63								70
Thin-Thick	SDI		—74							35	72
Heavy-Light	SDA		79								79
Heavy-Light	SDI		83								77
Fast-Slow	SDA			—63							56
Fast-Slow	SDI			—67				36			73
Dull-Sharp	SDA			63			—39				61
Dull-Sharp	SDI			62	—52						75
Weak-Strong	SDA			61						—36	66
Weak-Strong	SDI			68							62
Unpleasant-Pleasant	SDI				—69						68
Happy-Sad	SDI				65						56
Unfair-Fair	SDI				—81						75
Good-Bad	SDI				65						55
Good-Bad	SDA	43			40	36					59
Self-Criticism	TSCS					—77					68
Unfair-Fair	SDA					—42					59
Unpleasant-Pleasant	SDA						—78				77
Happy-Sad	SDA						72				69
Hot-Cold	SDA							78			74
Hot-Cold	SDI							81			76
Conflict	TSCS								76		63
Variability	TSCS	—43				—49			54		74
Passive-Active	SDA									—72	77
Passive-Active	SDI				—36					—57	61

* All decimals and loadings below .35 omitted.

Note: Factor I = Self-Acceptance; Factor II = Self-Strength; Factor III = Self-Activity; Factor IV = Ideal-Self Evaluation; Factor V = Defensiveness; Factor VI = Actual-Self Evaluation; Factor VII = Hot-Cold; Factor VIII = Conflict-Integration; Factor IX = Active-Passive.

factors. Factor IV is represented by those evaluation scales used in rating the concept Ideal-Self; and Factor VI has loadings in Actual-Self scales. Thus, IV was named *Ideal-Self Evaluation* and VI was called *Actual-Self Evaluation.*

Factor V is probably a rather large specific factor represented by a large loading in the self-criticism scale of the TSCS and moderate loading in the two SD-Actual Scales: good-bad and unfair-fair, both evaluation scales. A description of what the self-criticism scale measures (5) suggests Factor V is one of *Defensiveness.*

Factors VII, VIII, and IX appear to be rather large specific factors with loadings in only a few variables. These factors did not seem to warrant extensive interpretation. Factor VII was named *Hot-Cold;* VIII, *Conflict-Integration;* and IX, *Active-Passive.*

In the canonical correlation analysis between the self-as-object factors and the self-as-process factors, a chi square test of successive latent roots was performed. Table 2 summarizes the results of these tests. The first three canonical correlations are shown to be significant at the .001 level. The fourth latent root and corresponding canonical R, with three roots removed, resulted in a chi square of 101.2 which, with 78 degrees of freedom corresponds to a *z*-value of 1.76. This *z*-value was less than that necessary for significance at the .05 level. Consequently, no further canonical correlations were considered in the analysis. These tests indicate that three latent roots and the corresponding canonical correlations are of statistical importance ($p < .001$) and interpretive interest.

TABLE 2

X^2 Tests of Successive Latent Roots for Canonical Correlations

Number of roots removed	Largest latent root remaining	Corresponding canonical R	X^2	NDF	z	p
0	.555	.745	353.8	144	9.65	$<.001$
1	.488	.698	232.2	120	6.12	$<.001$
2	.314	.560	148.4	98	3.27	$<.001$
3	.233	.482	101.2	78	1.76	$>.05$

Table 3 presents the three largest and most important canonical correlations and their corresponding canonical vectors. These vectors are regression weights and indicate the mathematical strength of the several factors in each set in developing the relationship between the two sets of factors.

The first canonical correlation (.745) and the associated canonical variates

TABLE 3
WEIGHTS FOR THE VECTORS CORRESPONDING TO CANONICAL CORRELATIONS BETWEEN SELF-AS-OBJECT AND SELF-AS-PROCESS FACTORS*

Self-dimensions	Factor	Canonical R and associated vectors .745	.698	.560
Self-as-process	A			
	B			
	C			
	E		—306	—245
	F	316		—328
	G	—438	345	
	H	—213	250	—306
	I			
	L		—412	
	M	230		
	N			
	O		250	
	Q_1			
	Q_2	—334	—515	391
	Q_3			
	Q_4	402	347	
Self-as-object	1. Self-Acceptance	—583		—279
	2. Self-Strength	—417		
	3. Self-Activity		684	
	4. Ideal-Self Evaluation		481	
	5. Defensiveness	—617	288	281
	6. Actual-Self Evaluation			—534
	7. Hot-Cold			
	8. Conflict-Integration			229
	9. Active-Passive		335	—645

* All weights greater than .21 are presented above; decimals omitted.

were of major interest. The vector weights indicated that three factors from the self-as-object set were the primary contributors to the largest canonical correlation. Similarly, six of the self-as-process factors seemed to be important.

The second canonical correlation (.698) showed nearly as strong a relationship as the first. The vector weights showed that four self-as-object and seven self-as-process factors were major contributors.

The third canonical correlation (.560) and associated vectors indicated the relationship between the two sets of variables to be largely a function of four variables from each set.

D. DISCUSSION

From the factor analysis of the self-as-object variables, it seemed that when the college students rated their own self-concepts, they did so on several relatively independent dimensions. It was clear from an examination of the factor structure that those aspects of the self-concept measured by the TSCS were relatively independent of judgments on the SD. Factor I was almost exclusively defined by TSCS subscales; however, there was some tendency for the Actual-Self Evaluation scales of the SD to shift toward this factor. It is interesting to note the breakdown of the Evaluation factor and the apparent use of different kinds of evaluation for Actual-Self and Ideal-Self. In contrast to this lack of cross-concept generality of a single evaluative factor, the Potency and Activity factors were defined by both Actual-Self and Ideal-Self scales.

These data seem to contrast areas of disequilibrium or lack of integration. While these college students had apparently achieved an Actual-Ideal perceptual consistency regarding their strengths and abilities (Potency) and also their dynamic ongoing involvement (Activity) they saw a discrepancy in their worthiness and value (Evaluation), which they could not reconcile with their ego ideal.

These attitudinal dimensions of self-perception are not entirely independent of personality factors. The canonical analysis supported the hypothesis that in some respects the self-as-object and self-as-process were related. The vector weights associated with the three canonical correlations demonstrate that the strength of the observed relationships was largely a function of only nine of the self-as-process factors, while all the major self-as-object factors were contributors. Since the process or personality factors subsumed the attitudinal dimensions, it was reasonable to conclude that the self-concept in the attitudinal or self-as-object sense can be interpreted as only one aspect of the total personality sphere, at least at the source-trait level.

There was some suggested correspondence between the pattern of contributing factors in the self-as-process set and certain second-order-factor patterns of the 16 PF (4). Among the process factors contributing to the second canonical variate were the primary factors: H, O, L, and Q_4. These are four of the seven factors included in the anxiety second-order factor of the 16 PF. When students rate their own self-concepts and qualify various aspects of their personality, general anxiety becomes a highly determining variable. Certainly, anxiety can not be overlooked in any mode in which self-appraisal is required. The intensity and kind of anxiety can well be significant contributors to self-as-process or self-as-object responses. The third canonical variate had major weights for primary factors: E, F, H, and Q_2. These four factors are included in the five factors comprising the Introversion-Extroversion, second-order factor. When rating themselves, the decision of whether to inhibit or to express oneself also seemed to be an important determinant in self-projections. Empirical observations should focus more strongly on these established higher order constructs as sources of self-concept variation.

However, the first canonical correlation and associated vectors were of major interest, since this combination developed the strongest relationship. The pattern of vector weights for the process factors suggests a combination of personality factors that seem to define a general self-concept dimension: the dependent, expedient, tense individual, contrasted with the self-sufficient, conscientious, relaxed, and serious individual. Of all the determinants in self-measurement, this one general, identifiable construct emerges as the most promising for future research. Perhaps the closest label to its overall meaning is the concept of Self-Fulfillment. Only when the student could maintain some degree of integrated self-acceptance and recognize his need for some level of fulfillment, would he begin moving toward an ego ideal.

E. SUMMARY

The purpose of the present study was to determine if the dimensions of self-as-object are, in fact, dimensions of the same phenomena as self-as-process, or self-as-personality. Specifically, it was hypothesized that instruments purporting to measure self-as-object are assessing dimensions of the same phenomena as a standard personality inventory.

*S*s were 138 male and female undergraduate students enrolled in a course of educational psychology. The self-as-process was measured by the 16 Personality Factor Questionnaire, whereas the self-as-object was measured by a self-descriptive inventory, The Tennessee Self-Concept Scale (TSCS), and an adaptation of Osgood's Semantic Differential (SD) containing 12 bipolar adjective scales. On the SD, *S*s rated two concepts: *My Actual-Self* and *My Ideal-Self*.

The 36 self-as-object variables (12 TSDS; 24 SD) were factor analyzed and nine rotated factors were identified: Self-acceptance, Self-strength, Self-activity, Ideal-self evaluation, Defensiveness, Actual-self evaluation, Hot-cold, Conflict-integration, and Active-passive. When a canonical correlation analysis was performed between the nine self-as-object factors and the 16 self-as-process factors (16 PF scores), three of the nine canonical correlations were significant ($p < .001$). The results indicated that the self-as-process subsumed the dimensions of self-as-object, and yet did point up independent aspects of personality.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 287-292.

SAMPLING OF REDUNDANT CUES IN A SUCCESSIVE DISCRIMINATION PROBLEM*

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A. INTRODUCTION

Hergenhahn, Myers, and Capehart (3) found that, when redundant cues were inserted into a discrimination problem after its solution, their relationship to reinforcement was learned by *S*. These results were thought to be in accord with the theories of Restle (5) and Estes (2), from which it is predicted that all cues confronting *S* in an experimental situation will eventually be sampled. Conversely, the results were not thought to support the position of Sutherland, as reported by Mackintosh (4), which states that sampling of stimuli occurs only until a strategy adequate to solve the problem is found and then stops. The prediction from the latter point of view would be that redundant material would not be sampled as long as one strategy is working to solve the problem.

The present study is similar to the Hergenhahn *et al*. study (3), but differs in two ways: (*a*) a successive rather than a simultaneous discrimination problem was employed, and (*b*) rather than the insertion of new stimuli into the problem, relationships between various stimuli and reinforcement were manipulated. This last variation was designed to answer the question as to whether sampling took place in the first study merely because new information was inserted into the situation, thereby increasing the probability of its being attended to.

The revised design is very similar to one used by Bruner, Matter, and Papanek (1). In their study they found rats learned a single alternation pattern when it was superimposed over a black-white discrimination problem.

This study is an increasingly subtle way of evaluating the positions of Estes and Restle, on the one hand, and Sutherland, on the other. It remains possible that *S*s sample all stimuli once, but not continuously. In other words,

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* Received in the Editorial Office, Provincetown, Massachusetts, on September 1, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

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if stimuli are irrelevant and afterwards are changed to relevant, it could be that *S*s sample the first situation and not the second. Sutherland would still clearly say that neither relationship would be detected as long as one strategy is working. The prediction from the positions of Estes and Restle as compared with Sutherland is more complex. It seems every time a change is made in the relationship between stimuli and reinforcement the "problem" changes and sampling will be of what the problem is, so that stimuli when irrelevant will be sampled as such. The problem is in determining the rate of change when one stimulus dimension maintains its relationship to reward and another changes. Given enough time, however, all relevant and irrelevant stimuli should be sampled as such. It is possible, therefore, in an experiment such as described here, if minimal training trials are given, for the results to support Sutherland and, with extended training, support Estes and Restle.

B. METHOD

1. *Subjects*

*S*s were 60 undergraduates enrolled in elementary psychology classes at the University of Arizona.

2. *Apparatus*

On a panel were three slots and a 7.5-watt green bulb. One slot was to *S*s' left, one was to the right, and one was in the lower center. Stimuli were presented on 3 × 5 inch index cards.

3. *Procedure*

For the experimental *S*s training proceeded in three stages. For half of the experimental group ($n = 15$), the relevant dimension in Stage I was color (black or white). Size (large or small) and shape (triangle or circle) were irrelevant. In other words, for these *S*s in Stage I, responding to black was correct whether the object was a circle or a triangle, either large or small. In Stage II, both size *and* color were relevant and shape remained irrelevant. During this stage *S* could be correct by responding to *either* black or small objects or both. In Stage III, the original relevant dimension color was made irrelevant and size was maintained as the only relevant dimension. Shape again stayed irrelevant.

For the other half of the experimental group ($n = 15$), the procedure was the same as above except the relevant and irrelevant dimensions associated with Stages I and III were reversed. For these subjects size was relevant in Stage I and color and shape were irrelevant. In Stage II, both color and size were relevant as with the other half of the experimental group. In Stage III, color was relevant and size and shape were irrelevant.

Half the control *S*s ($n = 15$) were given Stage I exactly as were the first half of the experimental *S*s above, and went directly to Stage III. The other half of the control group ($n = 15$) started with Stage I as described for the second half of the experimental group.

In order to progress from one stage to another, it was necessary for *S*s in the experimental group to make eight consecutive correct responses.

All control *S*s were given eight trials beyond criterion on Stage I to equate approximately the number of exposures to the information in the second stage with the experimental *S*s. The experimental design is shown in Table 1:

TABLE 1

RELEVANT AND IRRELEVANT STIMULI FOR VARIOUS GROUPS AT THREE STAGES OF TRAINING

Group	*N*	Stage I	Stage II	Stage III
Experimental	15	Color (R) Size (I) Shape (I)	Color (R) Size (R) Shape (I)	Size (R) Color (I) Shape (I)
Experimental	15	Size (R) Color (I) Shape (I)	Color (R) Size (R) Shape (I)	Color (R) Size (I) Shape (I)
Control	15	Color (R) Size (I) Shape (I)	same as Stage I	Size (R) Color (I) Shape (I)
Control	15	Size (R) Color (I) Shape (I)	same as Stage I	Color (R) Size (I) Shape (I)

*S*s were read the following instructions:

> This is a simple learning experiment. You will be presented cards, one at a time, through this opening [pointing]. The cards will look similar to this one [showing model card]. You will either accept or reject each card. If you reject the card you will place it in this slot [pointing]. If you accept the card you will place it in this slot [pointing]. If you either accept a correct card or reject an incorrect card this light will go on [pointing]. If, however, you reject a correct card or accept an incorrect card the light will remain off.
>
> There are no rigid time restrictions, but make your choices as quickly as possible.
>
> Do you have any questions?

E sat behind the apparatus and could not be seen by *S*. The stimulus cards were presented in random order.

C. Results and Discussion

As can be seen in Figure 1, the number of trials necessary to reach criterion for the experimental and control groups in Stage I were very similar. However, the groups separated considerably in Stage III.

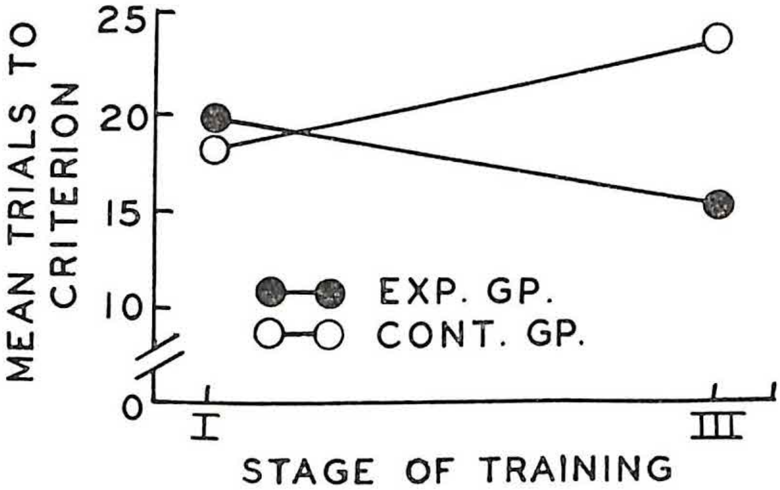

FIGURE 1
Interaction Between Experimental *vs.* Control Groups and Training Stage

Figure 2 shows the interaction between stimulus dimension and stages. It can be seen that the problem was always more difficult when size rather than color was the relevant dimension; however, this difficulty was reduced somewhat in Stage III.

A summary of the analysis of variance appears in Table 2.

The experimental *vs.* control group by stages interaction was significant at the .01 level, as was the dimension by stages interaction. No other source of variance reached significance.

Scheffe tests indicated the experimental and control groups differed significantly at Stage III ($p < .05$). The following differences were found to be significant at the .01 level: trials to criterion with size as the relevant dimension as a function of stage; trials to criterion with color as the relevant dimension as a function of stage; size *vs.* color at Stage I; size *vs.* color at Stage III.

Again the data do not fit Sutherland's position, from which it was predicted that *S*s would "switch in" an analyzer necessary to solve the problem and maintain it. This switching in would have taken place in Stage I and

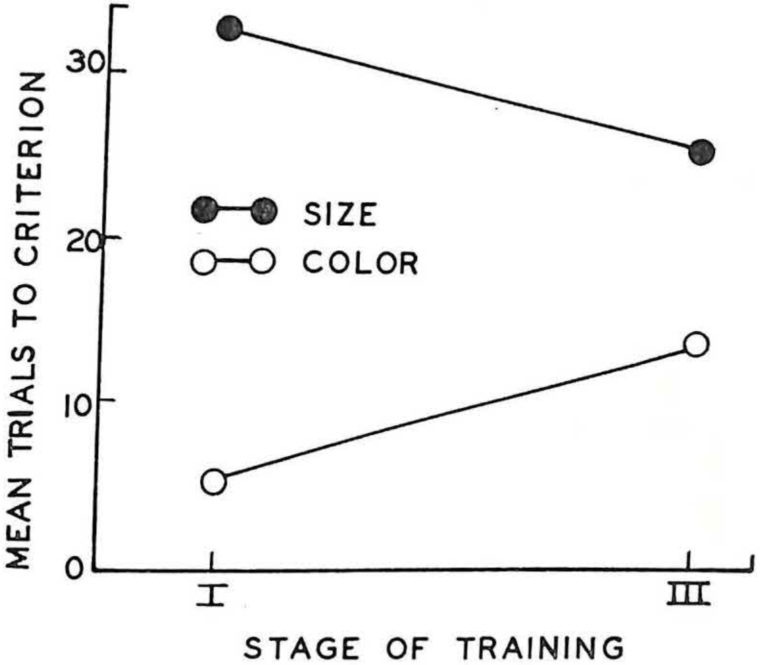

FIGURE 2
Interaction Between Relevant Dimension and Training Stage

have been maintained in Stage II. Little or no sampling of the newly inserted cues would have taken place. This was not the case. The data were in accord with the hypothesis of Estes (2) and Restle (5), who predict a relatively smooth transition between Stages I and III because of sampling in Stage II.

TABLE 2
Summary of Analysis of Variance

Source	*df*	*SS*	*MS*	*F*	*p*
(A) Experimental *vs.* Control	1	389	389	—	
(B) Stimulus dimension	1	1,795	1,795	3.155	
A × B Interaction	1	571	571	—	
Error (a)	56	31,885	569		
(C) Stages	1	8	8	—	
A × C	1	823	823	7.635	< .01
B × C	1	11,564	11,564	107.273	< .001
A × B × C	1	38	38	—	
Error (b)	56	6,036	107.8		
Total	119	53,109			

Thus sampling occurs both when new stimuli are inserted into the situation and when relationships between stimuli and reinforcement are manipulated. Sampling also occurs in both successive and simultaneous discrimination problems. From the stimulus sampling point of view of Estes and Restle, these results seem to indicate that the number of trials in Stage II were adequate for *S*s to learn the changed relationship of the previously irrelevant cue to reinforcement. So if the cues that were irrelevant in Stage I became adapted, they did not remain adapted.

D. Summary

Sixty human *S*s participated in a three-stage successive discrimination problem. The experiment was designed to evaluate two diametrically opposed hypotheses concerning stimulus sampling during discrimination learning. Sutherland, as reported by Mackintosh (4), predicts sampling occurs only until an adequate solution to the problem is found and then stops. Estes (2) and Restle (5) predict sampling is a continuous process which results in the eventual sampling of all the elements present in the experimental situation. The data supported the theory proposed by Estes and Restle.

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Published as a separate and in *The Journal of Psychology*, 1967, 67, 293-297.

PROBABILITY LEARNING IN CHILDREN AS A FUNCTION OF AGE, MAGNITUDE OF INCENTIVE, AND PERCENTAGE OF REINFORCEMENT*[1]

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A. INTRODUCTION

Studies of children's probability learning have shown an effect of incentive on asymptotic level of performance, but whether the relationship is a direct or indirect one is not clear, in view of an apparent discrepancy in results between experiments by Siegel and Andrews (2) and Brackbill, Kappy, and Starr (1), and experiments by Stevenson and Weir (4). In the experiments of Siegel and Brackbill, young children showed a higher asymptotic level of response under conditions of high reward for the correct response than under conditions of low reward. Stevenson and Weir, on the other hand, found a lower asymptotic level of response with greater reward for correct predictions. Stevenson and Hoving (3) attributed the difference in results to the variable of age; and in their experiment it was found that an indirect relationship between incentive and asymptotic level of responding exists for young children, but a direct relationship exists for college-age subjects. The present investigation was undertaken in order to clarify further the reasons for the discrepancy in results. Three relevant variables were chosen for systematic study: age of child, magnitude of incentive, and percentage of reinforcement. A five-choice contingency procedure was used in which the choice of only one stimulus was reinforced.

B. METHOD

1. *Subjects*

The *S*s were 96 male and 96 female children from Baton Rouge and Houma, Louisiana. The children were tested by six graduate students in the Depart-

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* Received in the Editorial Office, Provincetown, Massachusetts, on September 1, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This paper was presented at a convention of the Southwestern Psychological Association, April, 1963, in Dallas, Texas. It was supported by a grant from the Louisiana State University Foundation. The author wishes to thank the teachers and children of the various classes that participated for their cooperation.

ment of Education at Louisiana State University. The children were randomly assigned to the experimental treatment groups except for the following restrictions: three 5- to 6-year-old children were eliminated because they failed to understand the directions; children who said they did not like candy or games were excluded from the experiment; and children whose behavior was markedly deviant in any respect, as evaluated by his teachers, were excluded from the experiment. If a child was eliminated for any of the above reasons, he was replaced in the sample by random selection of another child. Equal proportions of male and female children were assigned to each experimental treatment condition.

2. *Apparatus*

The apparatus was a 9 inch × 15 inch double layer of heavy cardboard between which was inserted a large page of IBM-type paper. The paper had columns of printed circles upon it. The top layer of cardboard was cut in such a way that it was possible to expose five alternative circles at one time, and then to slide a cardboard shield down over the response after the child had marked his guess. The child thus had no visible record of his past responses. The marked paper provided a record of performance for each *S*.

3. *Procedure*

The *S*s were divided into 12 groups of 16 *S*s each in a 3 (Age) × 2 (Incentive) × 2 (Reinforcement Schedule) factorial design experiment. The age levels of children were 5-6 years, 9-10 years, and 14-15 years. A child assigned to the low incentive condition received only knowledge of the correctness of his response. A child assigned to the high incentive condition received both knowledge of the correctness of his response and an M & M chocolate candy. The children were rewarded for either 50 per cent of their correct responses or for 80 per cent of their correct responses, depending upon the treatment condition to which they had been assigned. Each child received 240 acquisition trials.

Subjects were tested individually in semiisolated rooms at their respective schools. After a brief exchange of greetings with *E* and answering questions as to his name and age, the child was instructed to guess which of the five possible alternatives on the printed form was the correct one. The particular positive stimulus (S_+) to be rewarded was the same throughout the trials, but it was varied from child to child. At the end of the 20- to 30-minute session, *E* thanked the child and told him he had done very well. The *S*s were requested not to discuss the game until everyone had had a chance to play.

C. RESULTS AND DISCUSSION

The response measure analyzed was the proportion of responses to S_+ in the final block of 40 acquisition trials. The mean proportions for each group are presented in Figure 1, and the analysis of variance is presented in Table 1.

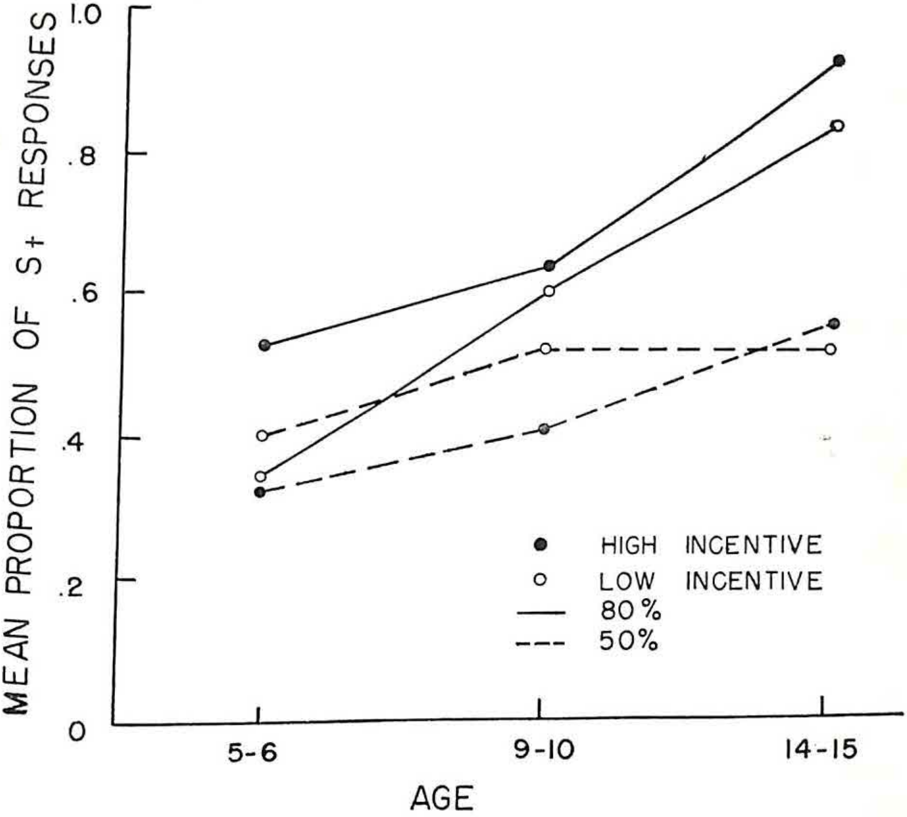

FIGURE 1

MEAN PROPORTION OF S_+ RESPONSES AS A FUNCTION OF AGE, MAGNITUDE OF INCENTIVE, AND PERCENTAGE OF REINFORCEMENT

The performance of *S*s differed significantly according to age and to reinforcement schedule. The older children had the highest proportions of correct responses, and there were more correct responses under 80 per cent reinforcement than under 50 per cent reinforcement. There was a significant interaction between age and schedule of reinforcement. The older the child, the greater the proportion of correct responses at the higher percentage of reinforcement. The effect may indicate that older children find it easier to overlook losses when not rewarded for responding to S_+; especially at the higher level of reinforcement. Younger *S*s may have varied their responses more than older *S*s in an attempt to increase their proportion correct.

A Duncan Multiple Range Test (MRT) was performed on the group means. The two highest means, for the 14-15, 80 per cent, low and high incentive conditions, differed significantly ($p < .05$) from all but the third highest mean, that of group 14-15, 50 per cent, High Incentive. The two lowest group means, those of group 5-6, 50 per cent, High Incentive and 5-6, 80 per cent, Low Incentive differed significantly ($p < .05$) from the six highest group means. Of most theoretical interest is the inversion of low and high incentive effects as a function of age at the 50 per cent level of reinforcement. The low incentive elicited the highest asymptote at the 5-6 and 9-10 age levels, but not at the 14-15 age level. The MRT and the analysis of variance indicate, however, that these effects were not statistically reliable. The effects are a partial confirmation of the findings of Stevenson and Hoving, who found similar, but reliable, interaction effects associated with age and incentive variables. The results at the 50 per cent level of reinforcement are not in line with the findings of Siegel and Andrews or of Brackbill, Kappy, and Starr, but they are not necessarily in conflict with them because of the probable existence of procedural differences. The Brackbill experiment, for example, utilized a noncontingent procedure, whereas a contingent procedure was used in the present instance.

TABLE 1

ANALYSIS OF VARIANCE OF PROPORTION OF S_+ RESPONSES AT ASYMPTOTE

Source	*MS*	*df*	*F*
Age (A)	16878	2	23.18**
Schedule (S)	13754	1	18.89**
Incentive (I)	417	1	—
A × S	3035	2	4.17*
A × I	599	2	—
S × I	2303	1	3.16
A S I	243	2	—
Error	728	180	—

* $p < .05$.
** $p < .01$.

D. SUMMARY

Twelve groups of 16 *S*s each were tested in a five-choice problem in which only one choice (S_+) yielded reinforcement. Three variables were combined in a factorial design: age (5-6, 9-10, and 14-15), schedule of reinforcement

(50 per cent and 80 per cent), and incentive (low and high). Significant differences were obtained in frequency of choice of S_+ as a function of age and of percentage of reinforcement. The interaction between age and percentage of reinforcement was also significant. Analysis of group means also suggested differences in the probability learning behavior of children at different age levels. The findings offer partial support for the hypothesis that the conflicting results of earlier probability learning studies on the effects of level of incentive are attributable to the differing ages of children tested.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 299-302.

REPLICATION OF AN INVESTIGATION OF CONCEPTS EXPRESSED BY THE TERM "TRUE" AS STATED BY EXPERIMENTAL AND CLINICAL PSYCHOLOGY STUDENTS*

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A. INTRODUCTION

This study constitutes a replication, modification, and expansion of an unpublished study by Adams (1) on an investigation of (*a*) concepts expressed by the word "true" among psychology students and (*b*) the degree of agreement reached when common definitions are used. Adams found that "vague" statements dealing with the "intension" and "extension" of the concept of "truth" differentiated at the .05 level between the "tough" and "tender" minded students. Such statements *did* indicate a fundamental divergence in their metaphysical and epistemological attitudes, the result of their several kinds of training and orientation.

Ness (2) carried out an empirical investigation of the meanings of "true" or "truth." He obtained subjects' formulated intensions and classified the formulations in several ways. He showed that all basic ideas of philosophers about "truth" can be found among laymen, and also that philosophers are usually incorrect in their evaluations of the views of the "man in the street."

The present study compared the "experimental-science" trained with those of the "humanities-philosophy" persuasion. The earlier findings were again fully replicated at the .005 level of significance, though a somewhat different method was used to explore the semantic extension of terms and concepts. There can be many implications to these findings, particularly in relation to the frequently heard assertion that many conflicts might be resolved with an integration of approaches to language and epistemology.

B. METHOD

Adams' original (1) study attempted to investigate semantically concepts expressed by "true" and "truth" among philosophy and psychology graduate

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* Received in the Editorial Office, Provincetown, Massachusetts, on September 5, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

students. In the 1967 replication it seemed more pertinent to use as subjects for Group A students committed to a science approach (those with 25 or more science units) and for Group B students of the clinical-humanities-philosophy persuasion (less than 25 science units). Laboratory classes in psychology were not counted as science units, since these courses were required of all psychology students.

A total of 162 senior college students (78 in science-experimental, and 84 in clinical-humanities) were required to classify 71 statements, including statements from metaphysical, politico-economic, mathematical, and logical categories. Ten of these questions were "vague" and dealt with the "intension" and "extension" of the concepts of "truth" and were designed to explore differences in students' metaphysical and epistemological attitudes. The classification of the statements by students—as to their *pro* or *con* the logical positivist position—was assumed to be the result of the training and interest in the "tough minded" science approach *versus* the humanities "soft minded" approach.

The statements were categorized by the *S*s on an answer sheet according to the categories true, false, either true or false, neither true nor false, and undecided. In order to facilitate the study and to assure maximum conciseness in subjects' discrimination, the instructions given to the students stipulated that, if possible, the answers be confined to the first two categories.

C. RESULTS

Table 1 indicates the findings of a two by two classification chi square analysis showing a significant difference between the two groups to be at the .001 level on each of the ten questions. Science majors preferred to define truth after the positivist position. For them truth is the same as "scientific truth": that is "truth which can be observed under ideal conditions," etc.

Humanities-clinical-philosophy psychology students begged off this "hard nosed" position with a very significantly observable consistency. This group tended toward a relatively indefinable status by assuming a somewhat relativistic position to the questions.

Inspection of the data reveals that each group demonstrated stable uniformity in the responses to the questions. There were no reversals in the trend; and the total number of subjects answering each question in a particular manner did not fluctuate, but rather showed a persistent trend.

D. CONCLUSIONS

The comparison of the two main groups reveals that relatively sophisticated subjects have formulated quite divergent definitions of "true" and of "truth"

TABLE 1
DISTRIBUTION OF C-EXTENSION RESPONSES IN SCIENCE AND HUMANITIES STUDENTS

Response	Group	Yes	No	Either, Neither, Undecided	X^2	Significance level
1. Truth is that set of possible items enabling action to be carried out effectively	Science A	26	51	7	11.88	.005
	Humanities B	45	29	4		
2. All events are in principle humanly knowable	Science A	58	22	4	15.09	.005
	Humanities B	31	43	4		
3. Truth is agreement with reality	Science A	48	27	9	24.85	.005
	Humanities B	17	54	7		
4. Nothing exists except sense data	Science A	55	24	5	16.46	.005
	Humanities B	27	46	5		
5. God exists	Science A	32	48	4	10.68	.005
	Humanities B	45	26	7		
6. No event occurs unless a corresponding physical event occurs	Science A	48	29	7	14.74	.005
	Humanities B	26	50	2		
7. Falsity is the same as scientific falsity	Science A	55	24	5	18.72	.005
	Humanities B	29	48	1		
8. There are events which are in principle unknowable by humans	Science A	29	49	6	12.47	.005
	Humanities B	47	30	1		
9. Falsity is disagreement with reality	Science A	50	27	7	12.04	.005
	Humanities B	29	46	3		
10. Truth is what we say is true	Science A	58	23	3	21.14	.005
	Humanities B	26	48	4		

with respect to the extension of terms as they define them. Differences on the student's c-extension of terms reflect some kind of fundamental divergence in regard to metaphysical and epistemological attitudes, which are not merely a matter of differences in intension of expressions or in affective tones.

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Published as a separate and in *The Journal of Psychology,* 1967, **67**, 303-311.

CONCEPT LEARNING IN SCHIZOPHRENICS AND NORMALS: SELECTION AND ADDITION OF CUES; EFFECT OF AMOUNT AND TYPE OF MEMORY INFORMATION*

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A. INTRODUCTION

It is now clear that schizophrenics can form concepts as can normals (3, 4, 5, 12). Recent studies have been undertaken on the effects of distracting stimuli on concept formation in schizophrenics.

Yates (13, p. 128) formulates the core problems of concept formation thusly: "We begin by conceptualizing the human operator as an information processing unit. The individual's initial problem is to organize the mass of incoming stimulation to the central processing system in a meaningful, sequentially ordered pattern. Broadbent's Filter Theory postulates that there is a limit to the amount of information that can be processed per unit of time. While the primary processing channel is thus occupied, other information must be held in the short-term memory system."

The present study is based on the hypothesis that the *basic* defect in the conceptualizing of schizophrenics is as follows: First, the rate at which information is processed by schizophrenics is abnormally slow. Since the short-term memory system, by definition, can hold information for only a short time, the amount of stored information lost per unit of time will be greater than in normals. Only a fragmentary part of the relevant stimulation will be successfully processed.

In studies of concept attainment, the basic postulate of the now generally accepted models (9) is that the subject's performance changes in continuous discrete steps. The present study aims at comparing the performance of chronic schizophrenics and normals in typical learning approaches to two-category concept-identification problems.

In concept identification problems of this type the subject learns a binary rule to classify a series of complex stimuli which vary in *n* binary dimensions.

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Cue Selection occurs when the relevant dimension (which always leads to correct responses) reaches the criterion of the errorless trial. In the process the *S* samples either hypotheses or cues based upon the dimensions and proceeds to test the relevance of the sampled hypotheses. If the *S* is correct, he retains the hypothesis for another trial; if he makes an error, the subject resamples with replacement from the population of available hypotheses. Cue selection is all-or-none; nevertheless, concept identification models assume that the *S* has some *memory* of the previous hypotheses which have been tried and rejected. If hypotheses were to be rejected as they were sampled and tested and found to be inconsistent with stimulus-response assignments, and if no new hypotheses were to be added to the initial pool, then the proportion of relevant hypotheses would increase in sudden, discrete steps. The question of what kind of resampling occurs has not been ascertained. For normals, memmory has been proven to operate (9) and has to be taken into account in the sampling process and learning rate. For chronic schizophrenics, memory loss interferes with efficiency of the Cue Selection process.

In addition to the cue-selection and memory functions, there occurs "Additivity of cues" (8). As *S* samples the complex stimuli, he learns something about each dimension; and the probability of a correct response results from an additive combination of the two associations (10). If *S* selectively learns, he may learn either one dimension or the other or both in solving the problem. Additivity of cues may simply mean that *S*s learn faster with redundant problems, since they have two opportunities, rather than one, to learn.

To learn more about the concept attainment process in chronic schizophrenics, the authors aimed to replicate studies (recently carried out with normals only) on *Cue Selection* and *Cue Additivity* (10) and on Availability of Memory Information (6).

1. *Cue Selection:* Trabasso, Bower, Gelman and Schaeffer (10) developed a model for the study of concept attainment through the active selecting out of relevant cues. With normals they demonstrated this as a two-stage, all-or-none process. Whatever factors affect cue selection also affect learning rate.

2. *Additivity of Cues:* In the Restle (7) model, cue addition occurs as the *S*, in processing information, learns something about each dimension. His probability of a correct response results from an additive combination of the associations.

3. *Type and amount of memory information:* Wolfgang and Pishkin (6) employed zero, one, two, three, or four available instances from past experience to measure the extent to which memory aids in concept learning. They found that availability of past experience had a facilitating effect. In their study the

greatest improvement occurred when up to four of the previous stimuli were exposed. The relative simplicity of the problem in their study might serve to explain why *S*s failed to benefit from additional past available information.

1. *The Hypotheses*

1. Cue selection can be utilized by schizophrenics in concept learning. Compared with normals of matched age, *IQ*, and education they are significantly slower, with more errors.

2. Cue additivity in schizophrenics seems not to be present to such a degree as to be significantly observable. Learning rate, as evidenced by time and errors, is not significantly more rapid when two dimensions, rather than one, are relevant and redundant.

3. *The memory effect* of providing up to four available instances from past experience does not have a significantly facilitative effect on concept learning in schizophrenics. The relatively complex nature of the problem used in this study might serve to explain why chronic schizophrenic *S*s failed to benefit from this past available information.

2. *The Subjects*

Six groups of twenty-five subjects were used in this experiment: three groups of chronic schizophrenics, Groups A, B, and C, and three groups of normals, Groups D, E, and F. Group A worked on the Cue Selection Task (Problem D); Group B on the Cue Addition Task (Problem D.L); and Group C on the Memory Task (Problem L). Groups D, E, and F, control groups, each consisted of 25 normal adult males (patients of a general hospital) of matched age and educational status. None of the normals had ever received any of the conventional psychiatric or psychosomatic diagnoses and none had any excessively anxiety-provoking diseases, such as cancer or tuberculosis. The schizophrenic patients were housed at several Southern California State and Veteran's Hospitals. The groups were matched on the basis of averaged Vocabulary-Arithmetic Reasoning subtest scores of the Wechsler-Bellevue Intelligence Scale on age and education.

In any investigation of aspects of mental processes, intelligence presents itself as the factor that should be equated for both groups. Among normal groups, this can be done by matching on the basis of *IQ*. A measured *IQ*, however, does not mean the same thing among psychotics as it does among normals. It is, therefore, impossible to measure on this basis with the use of present techniques. If total *IQ* is used as a measure of present functioning level, excessive interest variability of the schizophrenics would make individuals in the psychotic group favored in some areas and penalized in others. It seemed most germane to the purposes of this particular investigation to restrict matching devices to two subtests of the Wechsler-Bellevue Intelligence Scale which seemed most pertinent to the materials used in this investigation—the vocabulary and arithmetic reasoning subtests. These were employed as a basis of matching for intellectual functioning.

Wechsler (11) found vocabulary to have the highest correlation with total *IQ* of any of the subtests, and other investigators have found that the ability to attain a certain score on vocabulary tests is the least impaired of all examined abilities of schizophrenics. They have found that, when mental age is held constant, the schizophrenic is favored over the normal in taking a vocabulary test. Averaging the weighted scores of the vocabulary and the arithmetic reasoning subtests offset this advantage in favor of the schizophrenics, as Wechsler (11) indicated that there is some impairment of arithmetic reasoning among schizophrenics.

In our distribution of the two experimental groups on vocabulary and on arithmetic subtest scores, none of the differences among the groups is significant. Groups were matched for age, educational, and socioeconomic status.

The mean age of the normal subjects was 43.4 years (their ages ranged from 29 to 56 years). The mean age of the schizophrenic subjects was 45.2 years (their ages ranged from 31 to 66). A *t* test indicates this difference is not significant. There was no reliable difference between the normals and the schizophrenics on the intelligence estimates derived from the vocabulary and the arithmetic subtests of the Wechsler Scale. The normals had a mean standard score of 12.14 with a range from 6 to 15. The schizophrenics had a mean standard score of 10.54 with a range from 7 to 18.

In order to determine whether the tests used in the present investigation were capable of providing the necessary and sufficient conditions for patients to attain concepts, a preliminary study was undertaken. Throughout the literature the main measuring instrument for the investigation of concept formation has been the sorting test.

B. METHOD

The stimulus patterns were geometric figures drawn in crayon pencil on white 3 × 5 inch file cards. Five dimensions were used: Shape (triangle or circle), Location of Dot (above or below the figure), Color (red or blue), Position of an Open Side (left or right), and Number of Vertical Lines (one or two) within the Figure. In the Cue Selection Task, each *S* (in Groups A and D—Problem D) learned to classify cards by an anticipation method into two categories, Alpha and Beta, according to a rule. In the instructions, a complete description of the cards in terms of dimensions and values was given, along with examples. The *S* was shown one card at a time, self paced in his responses, and then, after responding received the correct classification. After four seconds, a new card was presented for *S*'s classifying. Training continued until *S* met a criteria of 32 consecutive correct responses, then he was asked to sort a test deck twice, without feedback, into categories. After sorting, each *S* was questioned about his solution hypothesis. With one dimension relevant (Location of Dot), its values were consistently paired with the categories, and they varied independently of the other four dimensions.

In the Cue Additivity problem (*S* Groups B and E—Problem D.L), two dimensions (Lines and Dots) were relevant and redundant; paired values from the lines and dot dimensions were consistently reinforced with the same categories. When a dimension was irrelevant, it varied independently of the other dimensions. In all problems, the color, shape, and open-side dimensions were irrelevant. The test deck consisted of similar patterns in which either the Line or the Dot dimension was "removed." No Dots appeared in the Line test cards, and no Lines in the Dot test cards. There were 16 test patterns for each relevant dimension; eight additional patterns were included to reduce guessing of solutions during the test series.

In the Cue Selection Task (*S* Groups A and D—Problem D), *S*s learned their problem (with only the Dot dimension relevant) to a criterion of 32 consecutive responses, and then were tested.

In the Cue Addition problem (*S* Groups B and E—Problem D.L), *S*s learned the problem with the Line and Dot dimensions relevant and redundant throughout training to a criterion of 32 consecutive responses and then tested.

To test the influence of memory, *S* Groups C and F (Problem L) were trained to criterion on the cue-selection task, using the Line dimension as relevant. Each *S* was (in this treatment) exposed sequentially to five conditions of number of available instances in the course of the concept learning task—i.e., zero, one, two, three, or four of the previously presented stimulus cards, in each of the two categories, Alpha and Beta, were placed in *S*'s view on any trial. These conditions were referred to a n-0, n-1, n-2, n-3, and n-4, respectively. The *S*s all began by responding to a single stimulus. This card remained in view while the next was presented. This procedure was continued until four past instances (the n-0 condition) were reached. After this level of availability, the earliest of all exposed stimuli was removed as each new one was presented. The *S*s' task was to categorize the above described geometric patterns in accordance with the one relevant dimension. The relevant dimension for all *S*s was the number of lines (one or two) inside the figure.

C. PROCEDURE

At the start of the session *S* sat at a desk, directly opposite *E*. The sorting pack and a sorting tray were placed in front of *S*. The instructions were as above except that *S*s were told that some stimuli of both the Alpha and the Beta instances of the rule would be left available for their inspection.

Trabasso and Bower (9) suppose that normal college student subjects, in the course of the concept attainment process, might discover that certain attributes are relevant, others not relevant, but they forget this information as other events intervene. When they forget it, the attribute again becomes an available candidate for sampling; a given cue might fail to pass any consistency test that takes place in any error trial, or it might have failed an earlier consistency test and not revived. The *S*s may be conceived of as having two lists: those attributes that are still effective candidates for being the relevant cue and those that have been temporarily set aside. It is assumed that they then select a cue from the pool of effective cues (the first list), with the sampling probability of any cue determined by its weight or salience. By providing *S*s with up to four available instances of examples of the Alpha and the Beta aspect of the rule, the authors hoped to help them to keep in view instances of relevant and irrelevant cues from which they can sample without having to depend so completely on cue-recall.

D. RESULTS

Table 1 summarizes the experimental findings for the Cue-Selection Task (Problem D) and Cue Additivity (Problem D.L) for chronic schizophrenics and normals. In the additivity problem, normals (Group E, Problem D.L) performed significantly better (fewer errors) and learned faster (time to criterion) than either single dimension group (Group A or D, Problem D). Chronic schizophrenics (Group A, Problem D) employed Cue Selection in learning the single dimension to criterion but significantly more slowly than normals and with significantly more errors. These results provide some evidence that Cue Selection operates in schizophrenics, as well as in normals. When learning rate is defined as the probability that *S* selects a relevant cue, estimates of this quantity might be used to make independent predictions as to how fast redundant problems are learned and which dimensions individuals are most likely to learn.

Results in Table 1, contrasting Group A with D and both with B and E, show that Additivity (defined as the result of averaging over *S*s who might actually learn only one or both cues, but each *S* has two probabilities of learning and might learn faster) occurs significantly often for normals but not for the schizophrenics. Chronic schizophrenics as a group in this study are not able to profit more by the two dimensional cue-sort than the one, to any significant degree. This defect might be attributable to their short-term memory problem (13).

Nineteen additional schizophrenic subjects—six in the Cue Selection problem, 13 in the Cue Addition problem—were unable to complete the task learning section of the problem. They were excluded from the sample. Three other *S*s in the Cue Selection and two in the Cue Addition task who were able to learn the task to the errorless trial criterion were unable to perform in sorting the test deck. Although they had utilized correctly the principle of sorting in learning the task to criterion they seemed unable to remember the principle to the point where they could utilize it in the test deck sort.

TABLE 1
SUMMARY OF RESULTS: CUE SELECTION AND CUE ADDITION

				Number of *S*s solving on	
Type	Group	Task	Mean errors	Dot	Both Line and Dot
Schiz.	A	1 Cue Dot	34.29	9	
Normal	D	1 Cue Dot	12.43	21	
Schiz.	B	2 Cue Line & Dot	36.61		5
Normal	E	2 Cue Line & Dot	07.52		19

The right two columns of Table 1 show the number of *S*s who were classified as having learned the Dot, the Line, or both dimensions. The classification was determined by *S*'s stated solution hypothesis and his correct sorting on tests. For the normals (Group D, Problem D.L) *S*s who stated a solution only on Dot sorted 90 per cent correctly on Dot Test cards but only 45 per cent (chance) on the Line Test cards; those who stated Lines, sorted 90 per cent correctly on that dimension but only 50 per cent correctly on the Dot tests: those who stated a solution on both dimensions sorted 95 per cent correctly on each. Generally for normals, verbalized solutions and sorting test results were in close agreement. For Group D (Problem D.L), since only eight of the 22 who learned solved both dimensions, the solution data seem to indicate that Cue Selection occurs in concept identification.

In Treatment 3, on type and amount of memory information, an analysis of variance on error scores indicated significant main effects for Availability of cues in normal subjects—Group F, Task I ($p < .001$). Results showed a linear decrease for errors as a function of number of available instances. For the Chronic Schizophrenics (Group E, Problem L), there were no clear-cut relationships between problem solution and the number of available instances from past experience. Providing the schizophrenic *S*s with from one up to four instances seemed to confuse the chronic schizophrenics who lost the *set* of cue selection and started trying to match stimuli for all cues rather than for the one relevant cue. Availability of past information facilitated concept learning in normals. This finding was consistent with the results of Bourne, Goldstein and Link (1), Cahill and Hovland (2), and Pishkin and Wolfgang (6). In view of the poor performance of the chronic schizophrenics on this part of the experiment (Group E, Problem L), it is plausible that providing additional available stimuli based on past experience ends in affording more distracting cues. The schizophrenic *S*s in this condition have difficulty concentrating on their own hypotheses and feed-back when at the same time they are trying to concentrate on the multiple cues of the past available instances. Instead of the past available instances affording them examples of the relevant cues, it seems to give them an opportunity to hypothesize concerning the relevance of those cues they have already discarded. This retards the Cue Selection process for them.

E. Summary

Normals utilize cue selection in concept learning. This process is discontinuous, all-or-none. Schizophrenics utilize the same process but are slower, less efficient. Since they are slow in decision making, schizophrenics are unable to retain the necessary memory items for comparison of one decision to the next; thus, their thinking seems confused or bizarre.

Normals add cues, as each *S* in processing learns something about each dimension in a multiple-cue sorting problem. The normal *S*'s probability of a correct response results from an additive combination of associations. The evidence in this study was that the schizophrenics could not benefit from recent past experience, probably because of attentional, motivational memory difficulties.

The memory effect of providing up to four available instances from past experience was not shown to have significant facilitative effect on concept learning in schizophrenics.

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Published as a separate and in *The Journal of Psychology*, 1967, 67, 313-318.

PERSONALITY AND FAMILY BACKGROUND CORRELATES OF STUDENTS' RESPONSE TO PHYSICAL DANGER* [1]

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A. INTRODUCTION

The present study was undertaken after the occurrence of Hurricane Betsy on September 19, 1965, when a river barge loaded with liquid chlorine sank to the bottom of the Mississippi River within one and one-half miles of the Louisiana State University campus in Baton Rouge, Louisiana. The lethal nature of chlorine, the disrupted conditions following the hurricane, and the proximity of the barge combined to cause a considerable public response. In addition, although it was known that the barge had sunk, it took a week of searching, with divers and radar-equipped airplanes, to locate it. Operations to raise the barge to the surface were then begun, and nine weeks after sinking the barge was raised, towed downstream, and emptied. The Office of Civil Defense, the Army Corps of Engineers, and the Chemistry Department at LSU stated that the possibility of tragedy was extremely remote, but that there would be high danger when the barge was to be surfaced. They therefore recommended an evacuation of the city and of the university for the one specific day of the barge lift.

The presence of the sunken chlorine barge afforded an opportunity to observe undergraduate anxiety responses to a natural environmental danger over an extended period of time. Related studies have been performed by Walker (10), who measured soldiers' expression of fear as a function of proximity to a planned atomic explosion, and by Rankin and Jones (6), who measured anxiety with the Manifest Anxiety Scale during the Cuban Missile crisis.

B. METHOD

At weekly intervals during the nine weeks preceding the raising of the barge, 71 students were administered a brief, direct questionnaire which stated: "A

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* Received in the Editorial Office, Provincetown, Massachusetts, on September 7, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This paper was presented at the Southwestern Psychological Association convention, April 22, 1966, Arlington, Texas. The investigation was supported by a grant from the Louisiana State University Foundation and by NSF Grant No. G-P-2812 to the LSU Computer Center.

barge containing 600 tons of deadly chlorine sank in the Mississippi River during Hurricane Betsy. It is in 60 feet of water near the Louisiana State University campus. Please check each of the following statements as frankly as you can. Your response will be treated confidentially." They were then asked to rate (*a*) "The likelihood that I will be injured or killed" and (*b*) "My anxiety about the chlorine barge situation" on six-point rating scales which ranged from "very, very low" to "very, very high." Near the time of the lifting of the barge a larger sample of 594 students answered the same questionnaire on two occasions, separated by a one-week interval. The students tested were sophomore- to senior-level undergraduates taking required psychology and education courses.

Three groups of students were selected from the larger group on the basis of their questionnaire responses: High Anxiety Female ($n = 10$), Low Anxiety Female ($n = 13$), and Low Anxiety Male ($n = 8$). Since only two high anxiety males completed the personality tests and family background questionnaire, their data were omitted from the analysis. Only students who had rated themselves similarly on the two occasions tested were selected, and students who had rated themselves low in anxiety were assigned to a low anxiety group only if they had remained on campus during the barge lift. Similar, but opposite, considerations governed the assignment of high anxiety subjects. That is, students who had rated themselves high in anxiety were assigned to a high anxiety group only if they had evacuated the city. Soon after the barge lift, these students were administered the Parent-Child Relations Questionnaire (7), the Edwards Personal Preference Schedule (2), and the Stern Activities Index (9). Information available in the student records of the LSU Registrar's Office was also used. The Parent-Child Relations Questionnaire (PCR) obtains a measure of the behavior of parents toward their child as experienced and perceived by the child. There are separate questionnaires for mother and father relationships. The Edwards Personal Preference Schedule (EPPS) measures 15 normal personality variables. The Stern Activities Index (SAI) measures 30 personality variables, 12 first-order personality factors, and three second-order factors.

C. RESULTS AND DISCUSSION

1. *Anxiety and Danger Ratings*

Analysis of variance of the Anxiety and Danger ratings ($X = \log X + 1$) over time for the smaller sample showed reliable trial ($F = 5.75$, $df = 7/980$, $p < .01$) and rating main effects ($F = 10.84$, $df = 1/140$, $p < .01$), and trial by ratings interaction effects ($F = 2.24$, $df = 7/980$, $p < .05$). The reported level of anxiety was consistently higher than the reported estimate of danger. Orthogonal comparisons of the means were performed via a multiple range test. During the week the barge was sunk but not yet located, the estimate of danger was relatively high. After the first week the danger estimate lowered and remained stable throughout the time period. Anxiety ratings showed more variability. Although causal relationships are not proven by correlations, the temporal shifts in anxiety appeared to be related to environmental events. There was a decrease in average anxiety ratings from the first to the fourth week, while engineering efforts at recovery of the barge proceeded smoothly. Anxiety ratings then increased from the fourth through the seventh week. During this time the date of the barge lift was twice postponed because of engineering difficulties. Previous research (3, 10) has also shown increases in anxiety related to temporal proximity of a threatening event. Anxiety ratings on the eighth week, however, were lower than the anxiety ratings on the seventh week. The decline may have occurred because the date of the barge lift was at last firmly fixed. Anxiety is related to the indefiniteness of future events (1).

Ninety per cent of the larger sample rated both their anxiety and the danger low; 7 per cent rated their anxiety high and the danger low; 1 per cent rated their anxiety low and the danger high, and 2 per cent rated both their anxiety and the danger high. Inspection of student records showed high anxiety ratings were significantly associated with being female, being an underclassman, and with not yet having had a course in chemistry ($\chi^2 = 8.22$, $p < .01$; $\chi^2 = 5.92$, $p < .05$; $\chi^2 = 6.99$, $p < .01$, respectively). In regard to the later finding, it may be noted that chemistry laboratories are stocked with chlorine and that chlorine is used in teaching and research. No association was observed between anxiety or danger rating and rural *vs.* city background, grades, number of courses failed, or employment level of parents.

2. *Psychometric Comparisons*

Most of the reliable differences found between groups on the PCR were obtained with the Father-Child Questionnaire. High Anxiety Females, however, reported receiving less physical punishment (D-O) from their mothers than did Low Anxiety Males ($t = 2.16$, $p < .05$). Physical punishment in this instance would include such behavior as the taking away of playthings, reducing allowance, denying promised trips, and so on. The fathers of High Anxiety Females were also less punitive ($t = 2.39$, $p < .05$) than the fathers of Low Anxiety Males. In addition, the fathers were, according to the respondents, less demanding and rejecting, but more loving and casual than were the fathers of Low Anxiety Males ($t = 3.56$, $p < .01$; $t = 2.33$, $p < .05$; $t = 2.59$, $p < .05$; and $t = 2.68$, $p < .05$; respectively). Low Anxiety Females reported receiving less demanding behavior and physical punishment ($t = 2.71$, $p < .05$; and $t = 2.39$, $p < .05$) from their fathers than did Low Anxiety Males. When compared with Low Anxiety Females, High Anxiety Females had higher scores on the PCR-Father subscales measuring love, protectiveness, and casualness; and lower scores on scales measuring demandingness, rejection, neglect, and symbolic punishment. Although individual subscale scores did not differ reliably, the consistency of the pattern clearly indicates that the father-child relationship was a differentiating factor in the background of low and high anxious females.

On the EPPS, High Anxiety Females had higher scores on Affiliation and lower scores on Endurance than did the Low Anxiety Females ($t = 2.33$, $p < .05$ and $t = 2.26$, $p < .05$). They had higher scores on the Nurturance and Affiliative subscales than did Low Anxiety Males ($t = 2.23$, $p < .05$ and $t = 4.36$, $p < .01$). Low Anxiety Males scored higher on Exhibitionism than did both Low and High Anxiety Females ($t = 2.56$, $p < .05$ and $t = 3.24$, $p < .01$).

Of the 30 traits measured by the SAI, four showed reliable differences between groups. The two female groups scored higher on Nurturance and Practicality than did Low Anxiety Males ($t = 5.96$, $p < .01$ and $t = 2.61$, $p < .05$). High Anxiety Females scored lower on the Objective subscale than did Low Anxiety Males ($t = 3.00$, $p < .01$), and they reported less interest in the humanities and social sciences than did Low Anxiety Females ($t = 2.22$, $p < .05$). These differences may be clarified by reference to the SAI factors. The factors are based upon a principal-components factor analysis of the 30 variables. Of most interest in the present study is the difference found between High Anxiety Females and the Low Anxiety Females on Dependency ($t = 2.13$, $p < .05$). The higher scores of the High Anxiety Females suggest a "generally higher level of dependent, submissive, socially controlled behavior." The higher scores on Timidity of the High Anxiety Females relative to Low Anxiety Females ($t = 3.27$, $p < .01$) indicate greater concern with risks and danger. The higher Audacity score of the Low Anxiety Females ($t = 2.40$, $p < .05$) represents greater personal aggressiveness, interest in science, fantasied achievement, and risk taking.

Kagan (4) has reported longitudinal research on child-rearing which has findings consistent with the results of the present study. A correlation between dependency in childhood and dependency in adulthood (.30) was found for girls, but there was no such correlation for boys. Kagan concluded that our culture allows and reinforces some dependency in females but rejects it in boys. A father who is loving and casual in regard to his daughter presumably permits or rewards dependency traits that she can maintain into adulthood. Perhaps the most surprising finding in the present study is the primacy of the father, rather than the mother, in differentiating the response to danger of male and female students. The explanation may be that children learn to look to their fathers for appraisals of the dangers of the "real," extrafamily world.

The data of the present study suggest that the positive affect of the father had undesirable consequences. According to research by Levy (5), overprotective mothers tend to raise children who are excessively timid and dependent. Perhaps research on fathers, or "Daddies," would reveal a similar result. Seventy per cent of the undergraduates in this study were from homes in which the father held a managerial or professional position, and it has been found that parents of high socioeconomic status are more loving in their behavior toward their children (8) than are fathers of low socioeconomic status. The conjecture made here is that the loving behavior of the fathers toward the High Anxiety Females in the present study tended toward overprotectiveness. The girls thus became more affiliative, timid, and dependent, and more anxious when exposed to external danger than did the Low Anxiety Females.

D. Summary

Undergraduate students made eight weekly ratings of the danger involved and of their anxiety following the sinking of a chlorine barge near their university campus. Danger ratings were lower and less variable than were anxiety ratings. Anxiety ratings decreased while recovery operations proceeded smoothly, but rose as engineering difficulties occurred and the date of recovery was postponed. Biographical data indicated that anxiety was associated with being female, being an underclassman, and with not having had a course in chemistry. Three groups of students were compared on three psychometric tests, the EPPS, the SAI, and the Parent-Child Relations Questionnaire. High Anxiety Females reported greater needs for affiliation, dependency, and timidity than did Low Anxiety Females, and also that their fathers had been more casual, loving, and protective than were the fathers of Low Anxiety Females.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 319-322.

STUDENT "GULLIBILITY": A SYSTEMATIC REPLICATION*[1]

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A. INTRODUCTION

Forer (1) and Ulrich, Stachnik, and Stainton (3) have demonstrated that students in introductory psychology courses typically accept favorable personality test evaluations even though, quite unknown to them, each student receives an identical interpretation. This experiment determines the effect of a negative evaluation of the personality test on students' ratings of generalized personality interpretations which were supposedly derived from the negatively evaluated test.

B. METHOD

Fifty-one students from an introductory psychology class were administered the House-Tree-Person (HTP) Test and were promised an interpretation of their personality based on this test. One month later each student received an identical (except for sentence order), hand-written copy of the following generalized personality interpretation, adopted from Forer (1):

> You have a strong need for other people to like you and for them to admire you. You have a tendency to be critical of yourself. You have a great deal of unused capacity which you have not turned to your advantage. While you have some personality weaknesses, you are generally able to compensate for them. Your sexual adjustment has presented some problems for you. Disciplined and controlled on the outside, you tend to be worrisome and insecure inside. At times you have serious doubts as to whether you have made the right decision or done the right thing. You prefer a certain amount of change and variety and become dissatisfied when hemmed in by restrictions and limitations. You pride yourself as being an independent thinker and do not accept others' opinions without satisfactory proof. You have found it unwise to be too frank in revealing yourself to others. At times you are extroverted, affable, sociable, while at other times you are introverted, wary, and reserved. Some of your aspirations tend to be pretty unrealistic.

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* Received in the Editorial Office, Provincetown, Massachusetts, on September 11, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] All subjects were informed of the exact nature of this experiment at its conclusion.

[2] The authors are indebted to Elaine Lavender for her assistance in conducting this experiment.

Each student was asked to rate the interpretation on a five-point scale ranging from "excellent" to "poor" and was also given the opportunity to make additional comments concerning the interpretation. The interpretations and rating scales were disseminated to the students on two successive days. On the first day, interpretations were returned to 24 of the students. The only comment made to this group of students was that the interpretations contained private information intended only for the individual concerned and they were asked to refrain from discussing the interpretations with one another. All interpretations and rating sheets were collected at the end of the class hour. On the following day, interpretations were returned to the remaining group of 27 students. Immediately prior to returning the interpretations to this latter group, the instructor informed the class that he wished to discuss certain aspects of the HTP test from which the interpretations were derived. Drawing from the investigators' experiences with the HTP and generalizing Swensen's (2) comments on the Draw-A-Person Test to include houses and trees, a 15-minute evaluation of the HTP ensued. An effort was made to portray the HTP as a relatively invalid and generally questionable personality assessment technique. Mentioned in this evaluation were the rather poor conditions under which the test was administered to the class, the low correlation between hypothesized meanings of different "signs" on the test and research findings, lack of agreement between different examiners with respect to both what was drawn and its subsequent interpretation, and the general deficit of empirical research with the HTP.

C. Results and Discussion

The data presented in Table 1 attest to the acceptance of such generalized personality interpretations. In both groups, the number of "good" and "excellent" ratings exceeded the number that would be expected on the basis of chance. Additionally, a chi square test revealed no significant differences between the ratings of the two groups.

Comments obtained from the students were very similar to those reported by Ulrich *et al.* (3). The following are examples of such comments, exerpted

TABLE 1
Personality Interpretation Ratings

Variable	Excellent	Good	Average	Poor	Very poor	Total
No evaluation	12	8	3	1	0	24
Negative evaluation	11	13	3	0	0	27

from those made by students in the group to which the negative evaluation of the HTP was presented:

> A. I think this was a great analysis of my personality—almost "reading me like a book."
>
> B. Although you stated in class that this test may be inaccurate, your evaluation of my personality is extremely close to thoughts I've often had.
>
> C. It shows a lot about how I really am . . . as a whole it was a good description of my inner personality.

These results replicate the earlier findings of Forer (1) and Ulrich *et al.* (3). More significantly, however, the results indicate that ratings of such generalized personality interpretations are unaffected by negative evaluations given the personality test from which the interpretations were reportedly derived. A plausible explanation of these not unexpected results is as follows. Students frequently state as a motive for enrolling in introductory psychology courses an interest in learning more about themselves and their personalities. As a result, these students are often quite awed by personality tests and the aura of mystery surrounding the interpretation of such tests. Thus, the stage seems set for the aspiring student of behavior to quickly, enthusiastically, and somewhat blindly grasp and accept information about himself which is hypothetically derived from personality tests. It therefore seems likely that this reinforcing value of the knowledge of one's own personality in combination with the often valid, but very general, personality description would counteract any negative evaluation of the personality test and produce the results reported above. This lack of relationship between an individual's knowledge of the empirical worth of a personality test and the probability of his acceptance and approval of personality descriptions derived from that test should additionally serve as a cautionary note for psychological examiners whose sometimes broad and overgeneralized personality interpretations of empirically questionable tests are reinforced by their clients' praise and approval.

D. SUMMARY

Each subject in two groups received an identical personality interpretation hypothetically based on his performance on a standardly used psychological test. For one group, the interpretations were disseminated without comment. A 15-minute lecture in which the various weaknesses of the personality test were elucidated preceded the distribution of the test interpretation to the second group. No significant differences in the ratings of the interpretations by the two groups were obtained. The number of "good" and "excellent"

ratings in both groups exceeded a chance expectancy. The failure of the critical lecture to affect student acceptance of the interpretations is attributed jointly to the reinforcing value of knowledge of one's own personality and the apparent validity of the very general personality descriptions.

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Published as a separate and in *The Journal of Psychology,* 1967, 67, 323-329.

DESENSITIZATION AND REDUCTION IN CIGARETTE CONSUMPTION*

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A. INTRODUCTION

A variety of hypotheses have been put forward to explain the mechanism of smoking. While it is possible that smoking cigarettes might give anxiety-relief, it may prove to be based on mechanisms other than reduction of anxiety—e.g., social imitation (10)—or it may represent a displacement activity (2). Analytically orientated authors relate smoking to oral eroticism (4).

Recently, a number of studies have been designed to investigate the efficacy of treatments derived from learning theory. Koenig and Masters (6) employed three methods of treatment for habitual cigarette smokers: systematic desensitization, electrical aversion therapy, and supportive counselling. Their study indicated that the personality of the therapist was of greater importance in the therapy than the type of treatment offered.

As far as the authors are aware, no studies have been carried out in which the patients were given an intensive desensitizing program which was related to their social difficulties. In the course of treating alcoholic patients for social anxieties (8), it was noted that, as the consumption of alcohol decreased, there was also a decrease in their cigarette consumption. The present report refers to the change in smoking behavior of five patients following a course of treatment that had been designed to remove the patients' social anxieties.

B. METHOD OF TREATMENT

The treatment is based on Wolpe's (12) method of systematic desensitization. Relaxation was induced by hypnosis in the first four cases, and with intravenous injections of Methohexital sodium in Case 5 (1, 5, 7). The patients' main complaints related to social difficulties and to excessive alcohol

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* Received in the Editorial Office, Provincetown, Massachusetts, on September 11, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] The authors wish to thank Dr. John Denham, Medical Director, St. Clement's Hospital, London, for his permission to publish this paper. The authors also wish to thank Dorothy Clare-Yeldham, Clinical Psychologist, for her critical appraisal of the manuscript.

drinking. A standardized stimulus hierarchy, developed at St. Clement's Hospital, London, is used for patients being treated for social anxieties. Initially, the patient is asked to imagine talking to one person only, a friend or a relative with whom he feels entirely at ease. The patient is given these instructions: "I want you to imagine talking to your best friend. It does not matter what you imagine talking to him about, but I want you to indicate whether you feel entirely happy in this situation." If the patient signals that he feels anxiety, or if his facial expression betrays evidence of tension, the stimulus is repeated until he is completely free from this anxiety. It is only when the therapist is convinced that the patient is completely anxiety-free, that he proceeds to the next step in the hierarchy.

Throughout the treatment session, the patient does not speak aloud, but silently imagines conversing with people. The second stimulus consists of talking to two people, and the therapist may now say: "I want you to imagine talking to Harry and Joan." As friends are added, the therapist refers to each of them by name, until the patient can imagine talking to 20 of his friends without any anxiety. When this stage has been reached, the patient is now at ease with these 20 people and the therapist refers to them as a "nucleus," rather than calling out each name individually. It is important that the group of 20 has an equal distribution of the sexes. When the patient can imagine talking to the nucleus without any anxiety, strangers are added, one at a time, until he can imagine talking to 20 of his friends in a room containing 100 people altogether. The number of friends is then reduced, keeping the number of 100 people constant. Later, a stage is reached, when the patient can imagine talking to several strangers in a room containing 100 strangers. Gradually, the number of strangers is reduced, until finally he is required to imagine talking to one stranger only, which, for the patients described in this paper, is the most difficult situation of all. When this stage has been attained, the patient usually finds that he is free from anxiety in all normal social situations.

C. CASE HISTORIES

1. *Case 1*

A 20-year-old, single, male patient was admitted to St. Clement's Hospital, London. On admission to hospital, he was drinking one or two bottles of whiskey each day. The patient did not regard this as excessive, and he only became sufficiently motivated for treatment when he began talking to a chronic alcoholic who was a patient on the same ward. In addition to drinking a great deal of alcohol, he had a craving for cigarettes, of which he admitted smoking 30 a day, though probably he smoked many more.

His detailed history showed that he was aware of difficulties in social situations: when going to parties, he could not converse freely with strangers, but would prefer to remain with friends he knew well. His difficulties in conversation applied to both sexes, and he complained of severe, throbbing headaches, which could be relieved only by alcohol.

The patient was given 23 desensitizing sessions relating to his difficulties in communication. Since his course of treatment, he no longer needs to drink to excess, and finds half a pint of beer sufficient. This aspect of the treatment has been reported elsewhere (8). Also, he now needs to smoke only five cigarettes a day. He continues to smoke in moderation, but this is no longer very important to him. A follow-up of two years shows that his cigarette-consumption remains at this new level, and his craving for tobacco seems to have disappeared.

2. *Case 2*

A 19-year-old, single, female patient was admitted to hospital on account of a "wedding-phobia." She first became aware of social difficulties at the age of 14, when asked to dance. She felt embarrassed, blushed, and developed panic feelings. Since that time, the patient has never really enjoyed dancing, even with her fiancé. She also has difficulties in a variety of other social situations: e.g., when meeting strangers, parting from friends, reuniting with friends. After drinking five to six measures of gin, her social anxiety, with its accompanying symptoms, would be reduced. The patient did not regard herself as an alcoholic, but recognized that, in the absence of treatment, her gin-drinking might gradually increase over the years.

On admission to hospital, she was smoking at least 10 cigarettes a day. Her smoking had a compulsive quality for she would wait eagerly for the break at work so that she might smoke a cigarette.

She was given 49 desensitizing sessions for her social difficulties and "wedding-phobia." Since her treatment, she has lost most of her social anxieties and can now envisage her forthcoming marriage. She still blushes occasionally, but much less than before receiving treatment. She now only requires an occasional cigarette, and is very proud of having reduced her cigarette-consumption to this low level, no longer needing to smoke at all while at work. She smokes a maximum of 10 cigarettes each week, and this level has been maintained for 15 months following the completion of her treatment.

3. *Case 3*

A 21-year-old, single, male patient was admitted to the hospital on account of alcoholism and psychopathic behavior. He had started drinking at the age of 20, and was drinking large quantities of brandy each night, and later also during the day. Apart from his great need for alcohol, he also smoked a great deal, and estimated his cigarette consumption to be 50 to 60 a day.

Detailed history-taking revealed that he had always found difficulty in making friends, and he remembered being very lonely as a child. At the age of 15, he set out deliberately to be expelled from school, and achieved this without difficulty by disobedience. On leaving school, he had many jobs, but rarely stayed with one firm for more than a few weeks. He had frequent clashes with his employers and was consequently dismissed. Gambling heavily on horses, dogs, and cards, he invariably lost, and then he would make good the required amount by stealing from the firms for which he worked.

Although he denied having any social difficulties as an adult, it was felt that he might benefit from a course of treatment in this sphere. When deeply hypnotized, the patient soon became aware of difficulties in social situations and he was surprised that these should be associated with such a high level of anxiety.

Following his course of six treatment sessions, his desire for brandy completely disappeared, and he no longer gambles. He has since married a former friend, and is making a home for his family.

Immediately after his course of treatment, he smoked only one ounce of tobacco each week, rolling his own cigarettes. Eight months after completing the treatment, he is now smoking one-half ounce of tobacco each day, still well below his pretreatment level.

4. *Case 4*

A married woman, aged 23, was referred for treatment on account of excessive blushing and gin-drinking.

Her symptoms commenced at the age of 17, when she went to the cinema with her fiancé and saw a film of a child being born. She felt faint and could not bear to look at the screen. After this incident, she avoided going to the cinema.

At the age of 18, she became conscious of blushing excessively. This would occur at any time, but mainly when she was in company; it caused her acute embarrassment and prevented her from going to visit friends. She refused invitations to parties because she feared that she might blush on such occasions, but she found that, after drinking four measures of gin, she no longer blushed, and that, after seven measures of gin, she felt very well indeed.

The patient started smoking at the age of 15, and her cigarette-consumption gradually increased. When she came for treatment, she regularly smoked 10 to 15 cigarettes each day, but when in company she needed a further 10 cigarettes during the course of the evening.

Following 21 desensitizing sessions, for her social difficulties, she has completely lost her desire to drink gin. Also, immediately after her treatment, she found that she no longer required cigarettes at all. She gave up smoking for a period of three months, but then started smoking again. Her present consumption, one year after completion of treatment, is about 10 cigarettes a day, but she has no desire to smoke more when in company. She still blushes occasionally, but this symptom has markedly lessened, and, on the whole, she feels much better.

5. *Case 5*

A married man, aged 32, was admitted to hospital because he felt that he was about to commit murder. He had previously been in prison for nearly five years for attempted murder, and feared that he might repeat the act in the near future.

When he was 16 years old, he drank up to 20 pints of beer in the course of an evening. At the age of 20, he started drinking spirits; and at this stage, he was drinking about one bottle of gin each day, recently changing to drinking brandy only.

He has never been able to have good personal relations with individuals, but has had no difficulty in talking to a crowd.

The patient started smoking at the age of 11; by the age of 16, he smoked more heavily and had developed a craving for cigarettes. On several occasions, he hunted for "dog-ends" under the beds in his dormitory. At this age, he was smoking 30 cigarettes a day; and one year later, he had increased this to 50 a day. His smoking behavior had remained more or less constant until his admission to hospital.

He was given six desensitizing sessions in relation to his social anxieties. After the treatment he felt at ease when talking to people in a public house, and no longer required excessive alcohol. Also, he now smokes only one-half ounce of tobacco each day. This lower level has been maintained for a period of 12 months, and his craving for cigarettes seems to have disappeared with his social tensions.

D. PRESENTATION OF DATA

The Taylor Manifest Anxiety Scale (11) was administered to all patients before and after treatment, and a significant decrease in scores was found after completion of treatment.

TABLE 1
THE PATIENTS' SCORES ON THE TAYLOR MANIFEST ANXIETY SCALE

Patient	Pretherapy score	Posttherapy score
Case 1	28 (15.7.65)	3 (27.10.65)
Case 2	38 (20.1.66)	21 (25.7.66)
Case 3	28 (22.4.66)	3 (2.6.66)
Case 4	38 (17.11.65)	22 (2.3.66)
Case 5	19 (24.6.66)	2 (14.9.66)

E. DISCUSSION

In the present report, the authors have tried to show that alcoholism may be successfully treated by reducing the anxiety that motivates the drinking behavior. In these five cases, the anxiety related to social difficulties. There seems no evidence at present to justify a general conclusion that alcohol addiction is invariably motivated by social anxiety, or that compulsive cigarette smoking is similarly motivated, for differences in personality dimensions have a very important bearing on the subject (3).

It must be emphasized again that these patients were treated for their social anxieties with their associated alcoholism, and not for their cigarette smoking. The change in cigarette smoking may be a part of the patients' general improvement, and may be brought about by the as yet ill-defined effects of the therapist in conjunction with his method of treatment. Koenig and Masters (6) in their study of habitual smokers found that "the unspecified qualities of the respective therapists were more intimately related to change in smoking than the treatments the therapists administered." In the present study, the therapist, himself a nonsmoker, used subtly disapproving gestures, such as hand movements used to disperse smoke, in addition to systematic desensitization. The treatment may, therefore, be a form of aversion therapy in conjunction with desensitization. Finally, it should be noted that the overall effect of the treatment reported in this study may be due to similar mechanisms operating in drinking and smoking, and it is suggested that these two habits may have a common denominator in social anxiety. A low posttherapy anxiety level may be an important requisite for the patient to maintain a lower level of cigarette consumption. The patients reported that they no longer had the compulsive desire to smoke incessantly, or to drink to excess. The patients have been followed up for periods of nine months to two years, and no relapse has been observed either in their smoking habits or in their pattern of alcohol drinking.

F. SUMMARY

This report refers to the smoking behavior of five patients who were being treated for social anxiety in relation to alcoholism. It was found that, as their alcohol consumption decreased, there was a parallel reduction in their cigarette consumption. The lowered level of cigarette smoking was maintained for long periods following completion of treatment.

It has been suggested that a low posttherapy anxiety level, as assessed by the Taylor Manifest Anxiety Scale, may be an important requisite for the patient to maintain his lower level of cigarette consumption. Possibly some as yet ill-defined factors may have been operative in producing this change: for example, the mildly aversive gestures of the therapist, a nonsmoker, may have been a contributory factor, in addition to the systematic desensitization of the patients' social anxieties.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 331-334.

COMPLEXITY-SIMPLICITY, CREATIVITY, INTELLIGENCE, AND OTHER CORRELATES*[1]

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A. INTRODUCTION

Since Barron (1) has found the complexity-simplicity dimension related to creativity, with more creative *S*s preferring more complex line drawings, it seems reasonable to conclude that a person's perceptual preference may be correlated with other important individual differences. Several studies by Eisenman (3, 4, 5, 6) have explored the complexity-simplicity dimension in terms of polygon preference. Taylor and Eisenman (7) found that creative art students preferred more complex polygons than did their less creative peers. Based on the above-mentioned research, the present study was designed to investigate correlates of complexity-simplicity preferences for polygons. Since unpublished research by the first author had shown preference for complexity related to a high (creative) score on the personality test purporting to measure creativity in a sample of college students, it was expected that these results would also appear in the present sample of high school students. Wallach and Kogan (8) have criticized previous creativity research by suggesting that the creativity measures are correlated with intelligence. The authors predicted, however, that there would be no relationship between Stanford-Binet *IQ* on the one hand, and either the personality measure of creativity or the polygon preference measures, on the other hand. Finally, on the basis of previous results (4), it was also predicted that there would be a negative correlation between most preferred and least preferred polygon choices.

B. METHOD

1. *Subjects*

The *S*s were 75 high school students from two classes, representing 10th, 11th, and 12th graders in an urban high school. Their mean Stanford-Binet *IQ* was 106.01 with a standard deviation of 10.5.

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* Received in the Editorial Office, Provincetown, Massachusetts, on September 14, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] The research was supported by a grant from Temple University, and the data were analyzed by the Temple University Computer Center.

2. *Measures*

The creativity measure consisted of a 30-item paper-and-pencil personality test entitled "Personal Opinion Survey." This test was composed of five short-form personality tests of six items each taken from Child (2), and chosen so that the personality characteristics should be consistent with creativity. The specific tests were tolerance of complexity, tolerance of ambiguity, scanning, independence of judgment, and regression in the service of the ego. A previous item-analysis from samples composed primarily of college students showed that all 30 items differentiated in the predicted direction between high and low scorers.

The *IQ* measure was the Stanford-Binet intelligence test.

Two complexity scores were used to elicit additional information. The total number of points on the most preferred polygons was used as "most preferred" measure, and a "least preferred" measure was obtained by totaling the number of points on the least preferred polygons. *S*s chose the three most and three least preferred polygons from a photograph of 12 polygons, including nine random shapes and three symmetrical polygons, all varying in complexity as defined by the number of points (3, 4, 5, 6, 7).

Grades were obtained from school records. Each *S*'s overall average was thrown into one of three categories in terms of the general appearance of his record.

Sex and birth order were supplied by *S*s on the answer sheets to the Personal Opinion Survey, which was the fictitious name given to the personality measure of creativity to make it seem nonthreatening.

All *S*s were tested during their class period by the second author, with the cooperation of the classroom teachers.

C. RESULTS AND DISCUSSION

The first prediction was that preference for complexity in polygons would be related to high scores on the Personal Opinion Survey. The median test was used, and all *S*s scoring 17 or above on the 30-item personality test were considered the high group, while all *S*s scoring 15 and below were considered "lows." For complexity, a general measure was obtained by considering all *S*s favoring more complexity as the high complexity group, while *S*s whose three least preferred polygons contained more points than their three most preferred choices were considered the low complexity group. The obtained chi square of 3.66, with 1 *df*, is significant at $p < .05$ (one-tailed test) and supports the prediction. These two tests, both related to creativity in one way or another, show some consistency with one another.

Table 1 shows the intercorrelation of all variables and indicates that none of the measures linked to creativity (the Personal Opinion Survey or the two polygon choices) is related to Stanford-Binet *IQ*. Thus, the objection which Wallach and Kogan (8) have expressed about other alleged measures of creativity would not seem to apply here, since they do not correlate with *IQ*. Unfortunately, however, the creativity measures show no strong relationship with each other: the strongest relationship is the near significant negative correlation of —.21 between least preferred choices and the Personal Opinion Survey (creativity) variable.

TABLE 1
INTERCORRELATION OF SEVEN VARIABLES

Variable	1	2	3	4	5	6	7
1. Personal Opinion Survey							
2. *IQ*	.14						
3. Most preferred polygon	.14	.11					
4. Least preferred polygon	—.21	—.18	—.54**				
5. Grades	.00	.33**	—.13	.07			
6. Sex	—.09	—.05	.12	.05	.29*		
7. Birth order	—.09	—.08	.04	—.10	.01	.09	

* $p < .05$.
** $p < .01$.

The highest *r*, —.54 between most preferred and least preferred polygons, confirms the authors' prediction and an earlier finding by Eisenman (4). *S*s tended to choose more complexity for their least preferred polygons (mean $=$ 41.5 points, $SD = 23.2$) than for their most preferred polygons (mean $= 31.8$ points, $SD = 14.9$). This latter result is consistent with data on college students which typically indicate that, with the polygons employed here, *S*s tended to reject more complexity than they chose (3, 4, 5, 6). The large standard deviation for the least preferred polygons indicates that the mean of 41.5 is not necessarily indicative of the choice of any given individual. However, the results are consistent with others showing that *S*s find high complexity not to their liking. Since complexity and creativity are correlated (1, 7), perhaps the most reasonable conclusion is that most *S*s are not creative and therefore do not choose high complexity.[2]

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[2] Females made higher grades than males, and grades were also related to *IQ*, as shown in Table 1. It should also be noted that without a fourfold classification of sex and birth order, as done by Eisenman (3, 5), correlations with complexity are not expected.

D. SUMMARY AND CONCLUSIONS

The complexity-simplicity variable has been linked to creativity by Barron (1) who used line drawings primarily, and by Taylor and Eisenman (7) who employed polygons. Thus, a more intensive investigation of the complexity-simplicity dimension was undertaken, with the use of polygons of varying degrees of complexity, as defined by the number of points. With 75 high school students as subjects it was found that (*a*) the paper-and-pencil personality measure of creativity, previously linked to originality, was related to preference for complexity, with high scorers on the "creativity test" tending to prefer complexity; (*b*) there was no significant correlation between *IQ* and the creativity test, or between *IQ* and polygon preference; and (*c*) there was a significant negative correlation of —.54 between most preferred and least preferred polygon choices.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 335-340.

A NOTE ON A NEW TEST OF CREATIVITY*

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A. INTRODUCTION

A possible relationship between humor and creativity has been considered in theoretical speculations of several psychologists (1, 6). Recently, findings from empirical investigations (2, 9) support the hypothesized linkage between wit and the creative process. These studies indicate that highly creative individuals, in comparison with individuals lower in creativity, exhibit a greater degree of "wit" in experimental situations. This should not surprise the layman who often associates creativity with "quickmindedness" and "cleverness." If one assumes that research has established a humor-creativity connection, might it not be worthwhile to alter the experimental paradigm and, instead of predicting humor from creativity, reverse the procedure and use wit as a means of assessing creativity? This paper reports a first step in that direction: the construction of a test to measure individual differences in one type of humor: ability to pun. It is hoped that a person's "punning ability" will reflect his overall creative potential, giving the behavioral scientist the opportunity to utilize the "lowest form of humor" in assessing the highest form of behavior, human creativity.

Although definitions of creativity are legion, the "creative person" is usually expected to manifest two types of behavior: (*a*) a willingness to manipulate (act upon) the environment; and (*b*) the production of new products: e.g., form associative elements into new combinations (7), transform (4), and evolve alternate organizations or integrations of diverse perceptions and decisions (8). These behaviors require the individual to be an active manipulator and innovator in his environment—to utilize information in new and meaningful ways in his dealings with the world. Most contemporary creativity theorists de-emphasize the "information storage" or "intelligence" notion as the most important component in creative behavior. In its place, *utilization of information* becomes the important variable (assuming, of course, enough intelligence in the organism so basic information is available). The question

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* Received in the Editorial Office, Provincetown, Massachusetts, on September 20, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

becomes not how much information is known, but how that information is utilized in dealing with the unknown. This approach to creativity, emphasizing individual differences in information utilization, suggests one possible reason why two people equal in intelligence can vary in creativity.

Any test that purports to measure creativity should tap the components of the creative process just outlined. A test that is quite satisfactory in this respect is Mednick's Remote Associates Test, RAT (7). The RAT is a 30-item, 40-minute test in which each item consists of three stimulus words which the examinee is asked to relate to each other by means of a single common association (a fourth word that is related by association with the first three). It is important to note that the answer to the three words in the item is associational, and *not* definitional, logical, or conceptual in nature. A typical RAT item is as follows:

1. cookies 2. sixteen 3. heart 4. ____________

The correct answer that should appear in the blank space is "sweet." Cookies are sweet, sweet is part of the phrase "sweet sixteen," and part of the word "sweetheart." As can be seen, the fourth word may be related to the other three in various ways for various reasons. The RAT requires the examinee to manifest behaviors associated with the creative process: he must "act upon" (manipulate) the stimulus words and produce a new product from them (there is no choice of answers provided, he must devise his own solution). Further, the stimulus words and the correct answer ("cookies," "sixteen," "heart," "sweet") are simple vocabulary items that are known to everyone—thus, intelligence differences should *not* affect scores on the RAT, as the components of information (familiarity with the necessary words) needed to arrive at the correct solution are known to every testee. (Compare this testing situation with the Miller Analogies Test, an examination that correlates with traditional indices of intelligence. Here, vocabulary differences between individuals have a great deal to do with performance on test items.)

The major difficulty encountered with the RAT is its validity (5). In some investigations RAT performance is highly correlated with indices of creative behavior; in other studies it is not. Nevertheless, some of the testing advantages achieved with the RAT were utilized in constructing the test reported here. Whether this new test can overcome the validity problems encountered with the RAT remains to be seen. The PUN test, like the RAT, requires the subject to manipulate words and give a verbal (written) response where no answers are provided. Unlike the RAT these answers can be scored in two ways: (*a*) the uniqueness of the response, and (*b*) the type of response (this will be explained in detail once the test is presented).

B. The PUN Test

Subjects taking the PUN test are given the following instructions:

> A list of words appears on the following pages. Your task is to make up a definition for each of these words. *NOT* the definition that the word would receive in a standard dictionary. The meaning you give each word will be based on a "pun"—defining the word by changing its pronunciation and/or the meaning of part(s) of the word. Most definitions can be stated in two to five words. No definition should exceed seven words in length. Also, do *not* use personal names or foreign words in your definitions. Here are some examples to help you understand your assignment. The word to be defined is on the left, its meaning is on the right.
>
> | | |
> |---|---|
> | bulldoze | *a sleeping animal* |
> | abuse | *a motor vehicle (bus)* |
> | jargon | *glass container missing* |
>
> Note that the definitions above are not dictionary definitions of "bulldoze," "abuse," or "jargon." Note also that the definitions are short. Don't worry about the literary quality of your definitions—all we want to see is that you understood the pun. Make your answer as brief and clear as you can.
>
> Some words are harder than others to define in this manner, and you might have to examine the item closely to "see the pun." Here are some examples of more difficult items:
>
> | | |
> |---|---|
> | illegal | *sick bird* |
> | parole | |
> | pa (father) role | *the father role (function)* |
> | hydrophobia | |
> | hy (high) drop phobia | *fear of falling from high places* |
>
> Try this last example: armature ______________________. The answer is at the bottom of the page.[1] Once you have done this please wait quietly for the signal to begin. Do not open your booklet. You will have 15 minutes for this exercise. Work carefully and steadily. Do not spend too much time on any one item. Are there any questions? Please begin.

In the initial administration of the PUN test, 149 Princeton undergraduates completed an average 41 out of the possible 50 items ($SD = 8.37$). No subject had trouble with the instructions, nor did anyone encounter difficulties writing definitions seven words or less in length. Thus, the concern that a subject might not be able to "make a pun" under the existing testing conditions seems unwarranted. Further (with the exception of a few snickers at the outset of the testing session), subjects took the test seriously; and, more important, were *highly motivated,* both during and after the testing session. Many students volunteered the information that the test was "unique," "challenging," and "fun," and remained after the testing session to discuss answers and find out their scores. Wallach and Kogan (10) have emphasized the need for creativity tests which are interesting to the testee. The value of the PUN test in meeting this need should not be overlooked.

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[1] Answer: limb of a grown man.

C. Scoring the PUN Test

There are two major ways in which the PUN test can be scored. It will be easier to understand the scoring rationale if examples are provided.

1. *Scoring Dimension 1: Commonness-Uniqueness*

If 150 subjects are asked to make a pun response to a given stimulus word, the number of different responses and their frequencies will vary. For example, take the word KIDNAP. In this case there is a highly dominant response—"child sleeping"—given by almost every subject. A much less frequent response is "goat sleeping." Both answers constitute a pun on the word KIDNAP but one is a more unique (statistically improbable) response. Another example is the word CURTAIL. Here the most common correct answer is "tail of an animal." However, other correct (unique) responses include "bitter beer," "short story," and "short illness." In the current scoring system, the determination of a unique response is a statistical decision. In the first study employing the PUN test an arbitrary decision was reached: any correct response that occurred less than 10 per cent of the time in the subject sample was "unique." This method for determining unique responses, and the conception of such a response, is quite similar to measures and concepts utilized by Wallach and Kogan (10) and Guilford in his Uses for Things Test (3).

Eventually it is hoped that a diverse subject sample can be tested to provide norms for all possible responses to a given stimulus item, thereby assuring a more accurate (not dependent on a unique sample) indice of uniqueness for any response word. This manual would be similar in structure and use to the word association norms available today. With the use of such a manual, a more precise means of scoring subjects' responses could be achieved. Instead of scoring a response as simply "common" or "unique," exact probability figures could be assigned to each answer.

2. *Scoring Dimension 2: Type of Response*

Besides being "common" or "unique," a response can be of a specific type. Response "type" is determined by the way in which the subject utilizes the stimulus word in arriving at his answer. Take the word OVERTIRED. One possible correct response to this stimulus is "seven tires on a car." This is the simplest possible manipulation of a word to achieve a pun: the meaning of one syllable in the word is changed to accomplish the task. Such a technique is called *syllable redefinition*. A more difficult manipulation requires a transformation of the structure of the word in arriving at a pun—labeled *syllable restructuring*. In this case the subject makes the pun by changing the pronunciation structure of the word rather than the definitional properties of a given syllable in the word. An example of a solution for OVERTIRED utilizing the principle of syllable restructuring would be "outwardly angry." The subject has arrived at the pun by changing the pronunciation of the word from OVERTIRED to OVERT-IRED. To make this response, the subject had to overcome the traditional way of seeing (responding to) the word before he could arrive at his answer. To illustrate further, one can take a word dear to psychologists' hearts: THERAPIST. By proper manipulation of the structure of the word one can accuse our hapless practitioner of a vile act. One final illustration: KINDRED. By changing the definition of the word's second syllable one has the answer "fear of relatives." By a different pronunciation of the word, however, one comes up with KIND-RED or "generous color." Responses that are based on syllable restructuring are less common than those arrived at by syllable redefinition, and for this reason unique responses are most often those involving a different pronunciation of the stimulus word.

Another means at arriving at a pun is through the method of *modified syllable pronunciation*. This procedure involves giving meaning to one or more syllables in a word by modifying the pronunciation of one or more syllables in the word. The major difference between the method of modified syllable pronunciation and syllable restructuring is that in the former case the pronunciation of an established syllable is being modified, while in the latter the structure of the word is being changed. Consider the example FEROCITY. A relatively common response that is attained by changing the pronunciation of the first two syllables is "city of iron." A less common response arrived at by the same manipulation is "Egyptian city, or city of Pharaohs." Even more unique responses utilizing the modified syllable pronunciation technique include: "fear of city," "where gophers live," and "city plowed up." In test items where it is possible (e.g., KIDNAP) to arrive at a solution by simple syllable redefinition, almost every subject will arrive at a correct answer. In cases where an answer is dependent on a modified syllable pronunciation or syllable restructuring task, however, subjects often leave the answer sheet blank or give a response that does not utilize the complete stimulus word in the pun (a major cause of incorrect responses).

D. The Present Status of the Testing Instrument

Currently, the search is continuing for stimulus words that will effectively discriminate among subjects on the basis of the (*a*) commonness and (*b*) type of responses they give. At the same time different forms of the test are being devised (e.g., multiple choice items, items that require multiple responses) to examine whether they might be more effective instruments for assessing punning behavior. Finally, methods are being developed for objectifying the scoring of PUN test responses. This is being accomplished, in part, by obtaining interjudge agreement on what constitutes a "right" and "wrong" answer to each stimulus item in the PUN test.

E. Summary

A new creativity test is described in which subjects are required to "make up a pun" to each of 50 one-word test items. The subjects' answers are scored according to the uniqueness (statistical frequency of occurrence) and type (the way the subject manipulates the stimulus word in arriving at his solution) of response. The conception of the creative process underlying the development of the test is presented.

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Published as a separate and in *The Journal of Psychology*, 1967, **67**, 341-345.

MEDICARE: A DISASTER FOR THE AGED PSYCHIATRIC PATIENT?* [1]

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AND DANIEL L. GREENBLATT

A. INTRODUCTION

By the end of the first nine months of operation of the Medicare Act (PL 89-97), which allows up to 100 days of extended care following hospitalization, more than 500 hospitals with 28,000 extended care beds and over 3700 extended care facilities with a bed capacity of approximately 265,000 were providing posthospital nursing and medical services (5). Beds in hospitals for the care of acute conditions were freed by the transfer of patients to facilities for continued care and convalescence. With more than one-third of the skilled nursing home beds in the nation being used for short-term extended care, what has happened to the many patients in nursing homes who require long-term care or more than the 100 days provided under PL 89-97? Most extended care facilities are nursing homes that have met the minimum standards of the Medicare Act. Thus the reclassification of nursing homes as extended care facilities has reduced the number of nursing homes available for the long-term care of the psychiatrically ill patients admitted from the community, from general hospitals, and from mental hospitals.

Under the provisions of the Kerr-Mills Act of 1960 (Medical Assistance to the Aged), many thousands of hospitalized patients whose psychiatric illnesses had improved were placed in nursing homes, mainly because no other suitable form of aftercare was available outside of the hospital. From the standpoint of not having to return to the hospital, a large proportion of these placements were successful. These patients required long-term care and for many the expectation was that they would live the remainder of their lives in an institutional facility for the aged.

Medicare, geared to short-term care of patients, may have resulted in the

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* Received in the Editorial Office, Provincetown, Massachusetts, on September 22, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This study was performed under United States Public Health Service Research Grant MH 1624 from the National Institute of Mental Health, U.S. Department of Health, Education and Welfare.

removal of long-term patients from nursing homes converted to extended care facilities. In some instances they may have been admitted or readmitted to mental hospitals. This may be a step backward. Nursing homes are not the last word in therapeutic management but at least allow for some individualizing of treatment and for medical and nursing supervision.

On the first anniversary of Medicare (July, 1967), it seemed appropriate to review its effect and impact on a system that prior to the introduction of Medicare was fairly successful in maintaining patients in the community. The advent of Medicare gave rise to many expectations. Personnel involved in the care of the aged psychiatric patient soon became involved with the implications of Medicare for the patients already resident in nursing homes approved as extended care facilities. Under the provisions of this Act, stability and certainty were replaced by mobility and uncertainty, security by insecurity, as patients were moved from one nursing home to another to make way for new arrivals from general hospitals. Each year over $4 billion dollars will be poured into the nation's hospitals, nursing homes, and doctors' offices by the federal government as a result of Medicare. Yet, for the psychiatric patient the net effect may be *repeated* transfer, with the ultimate destination being the grave or the state mental hospital.

B. METHOD

The present study proposed to investigate the vicissitudes of a sample of psychiatric patients during the first seven months following the implementation of the extended care provisions of PL 89-97. Patients in approved extended care facility homes (ECFs) were compared with patients in nursing homes *not approved* as extended care facilities for changes in status during the period from January 1, 1967, to August 1, 1967.

The sample of 106 patients had previously participated in a systematic study of therapeutic activities in 16 homes focussed around consultation, direct assistance with emergencies, regular visits, educational activities, and the stimulation and initiation of rehabilitative and recreational activities (4). These interventions were able to reduce significantly death rates and return to the hospital for psychiatric reasons. Six months after the activities were concluded effects persisted, particularly in relation to reduced rate of rehospitalization. Three of the homes with 18 patients in them as of January 1, 1967, were approved as ECFs. The remaining 13 homes, with 88 patients, were not approved or did not apply for certification. Patients in the three approved ECFs were compared with patients in the 13 nursing homes for the following variables: (*a*) Disposition—living in the nursing home, living in one's own home, transferred to another home, dead or rehospitalized, transferred to home for the aged, rest home, chronic hospital, or general hospital; (*b*) Mental functioning—as measured by a mental status exam used in the earlier study (4); (*c*) Activities of daily living—ability to perform, as measured by a 12-item activities of daily living instrument used in the earlier study (4).

C. Results and Discussion

Of the 88 patients in the study who on January 1, 1967, were in nursing homes not approved as extended care facilities, *73* remained in the same homes. *Five* were transferred to other nursing homes or rest homes. *Two* were returned to a mental hospital and *one* was in a general hospital at the time of the follow-up. The remaining *seven* died.

Of the *18* patients in homes approved as ECFs, only *four* remained at the time of the study. *Ten* were transferred to other nursing homes or rest homes, *one* was returned to a mental hospital, and *one* went to his own home. *Two* patients died. Thus 83 per cent of patients from homes which did not become extended care facilities remained in the homes in contrast to 22 per cent of those in approved ECFs ($\chi^2 = 27.7$, $df = 1$, $p < .001$). Comparison of the 15 patients leaving the nursing homes with the 14 leaving the ECFs revealed a significant difference for transfer to other nursing homes or rest homes ($\chi^2 = 4.2$, $df = 1$, $p < .05$), with proportionately more patients being moved in this manner from ECFs but remaining alive.

Analyses for relative changes in mental status and for activities of daily living during the period August, 1966, to August, 1967, yielded no significant differences between groups (73 nursing home patients *vs.* four ECF patients) or within the entire sample as a whole for whom these data were obtained over a two-year period: August, 1965; February, 1966; August, 1966; and August, 1967.

Two basic conclusions emerge from the findings:

1. Conversion of nursing homes to extended care facilities resulted in the transfer of long-term psychiatric patients out of the ECFs to nursing homes. Contrary to findings of previous studies (1, 2, 3), short-term follow-up did not reveal an increase in death rate or in rehospitalization.

2. Patients remaining in the ECFs did not show a relative improvement in mental status or in the performance of the activities of daily living. The intensive and augmented rehabilitation programs of the ECFs had no observable effect on these patients.

In exploring with nursing supervisors some of the effects of the changes removal of long-term patients from nursing homes converted to extended care facilities. In some instances they may have been admitted or readmitted to mental hospitals. This may be a step backward. Nursing homes are not the last word in therapeutic management but at least allow for some individualizing of treatment and for medical and nursing supervision.

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In exploring with nursing supervisors some of the effects of the changes brought about by Medicare, several themes recurred. One was the universal report of increased paperwork and emphasis on administration and organization at the expense of direct patient care. Most were protective and fond of geriatric patients from the mental hospitals. They had made special efforts to help the patients adjust to the homes. The nurses urged the patients to participate in activities, and they and the staff worked intensively with individual patients.

Yet as members of the utilization review committees, under pressure to free beds for short-term patients from general hospitals, they were forced to make the decision to transfer these patients to more custodial settings. Feelings of guilt and of having let down their patients intermingled with a sense of being powerless to do otherwise. This conflict was not confined to patients from mental hospitals. Many patients admitted from the community or from general hospitals had come to regard the nursing home as their home. The supervisor had the unpleasant duty of telling the patients that they were to be transferred. For some it was a heart-rending experience. Patients cried and became depressed and sullen, while their friends wondered who would be the next one to go.

During this same period fewer and fewer ECFs have been willing to accept elderly psychiatric patients, making it necessary for the mental hospitals to use substandard homes. Due to the failure to construct adequate facilities, to train new nurses, and to recruit sufficient numbers of experienced nurses for the long-term custodial facilities, Medicare has in some instances led to downgrading instead of improving the care of long-term patients shunted to substandard nursing homes. Outside of an increase in cost and in administrative complexity, it is hard to see what Medicare has contributed up to this time to the extended care of these patients. For the psychiatric patient, it may well turn out to be a disaster.

D. SUMMARY

On January 1, 1967, the extended care benefits under the Medicare Act (PL 89-97) became effective. Nursing homes which satisfied conditions for participation were certified as extended care facilities to provide 100 days or less short-term intensive aftercare for previously hospitalized patients. The purpose of this study was to investigate the impact of Medicare on a sample of elderly psychiatric patients in nursing homes by comparing 18 patients in three ECFs with 88 patients in 13 nursing homes not approved as ECFs for the following variables: (*a*) disposition after seven months; (*b*) mental functioning as measured by mental status examination; and (*c*) self-care as measured by ability to perform activities of daily living.

Proportionately more nursing home patients remained in the same homes, while ECFs transferred relatively more patients to nursing homes.

No differences were found for change in mental status and activities of daily living or for rehospitalization.

Continued transfer of long-term patients from ECFs may adversely affect the aftercare system, which prior to the introduction of Medicare was successful in maintaining in the community vast numbers of elderly psychiatric patients without homes or without effectual families to which to return.

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